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ENVIRONMENTAL PROTECTION AGENCY
ALTERNATIVE REMEDIAL CONTRACTING STRATEGY (ARCS)
REGION III
CONTRACT #68-W8-0092
WORK ASSIGNMENT #92-12-3L54.0

FIELD SAMPLING PLAN

AUGUST 1990

REMEDIAL INVESTIGATION/FEASIBILITY STUDY

HAVERTOWN PCP SITE
HAVERTOWN, DELAWARE COUNTY

TETRA TECH, INC.

TCN 4212

AR300001

HAVERTOWN PCP SITE

FIELD SAMPLING PLAN

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1.0 INTRODUCTION

This Field Sampling Plan (FSP) addresses all field activities associated with the Remedial Investigation/Feasibility Study at the Havertown PCP Site (HAVERTOWN). The field sampling and investigative activities to be performed at HAVERTOWN have been divided into two phases. At this time, Tetra Tech has been instructed by the United States Environmental Protection Agency (USEPA) Remedial Project Manager to perform Phase I field activities only. Phase I field activities include:

- Measurements of ground water levels and free product thickness once a month for six months;
- Two rounds of ground water sampling;
- Installation of four ground water monitoring wells;
- Abandonment of unused monitoring wells;
- Retrofitting the existing monitoring wells with above grade well casings located in residential areas with flush-to-grade curb boxes;
- Surface water and sediment sampling in Naylors Run near the site;
- Storm water runoff and sediment sampling in the storm sewer that discharges into Naylors Run;
- TV surveillance of the storm sewer; and
- An environmental assessment of the stream and adjacent areas.

This FSP is intended to supplement the Quality Assurance Project Plan (QAPjP), and shall be used by Tetra Tech personnel and subcontractors as a guide for conducting field activities. The FSP is intended to be a stand-alone document, and includes the information required to carry out the

Phase I field activities. All activities shall also follow the guidelines of the QAPjP and the Health and Safety Plan (HSP) for the site.

2.0 SITE BACKGROUND

The HAVERTOWN site is located in Havertown, Haverford Township, Delaware County, in the southeastern portion of Pennsylvania. The site is located approximately 10 miles west of Philadelphia and is surrounded by a mixture of commercial establishments, industries, parks, schools, and residential homes (Figure 2-1).

The investigated area consists of a wood-treatment facility operated by National Wood Preservers (NWP), an adjacent bubble gum manufacturing plant owned by the Philadelphia Chewing Gum Company (PCG), and neighboring residential and commercial areas (Figure 2-2). A detailed description of site history, physical setting, and previous site activities can be found in the Tetra Tech Work Plan for this site.

Overview of Site Contamination

From 1947 to the present, NWP has used several wood-treating solutions in both their pressure and dip treatment operations. Known chemical solutions include (R. E. Wright RI Report, September 1988):

- 5% pentachlorophenol (PCP) mixed in a petroleum solvent and mineral spirits solution (1947-1978);
- Tantalithe, also known as Fluoro Chrome Arsenate Phenol (1947 - ?);

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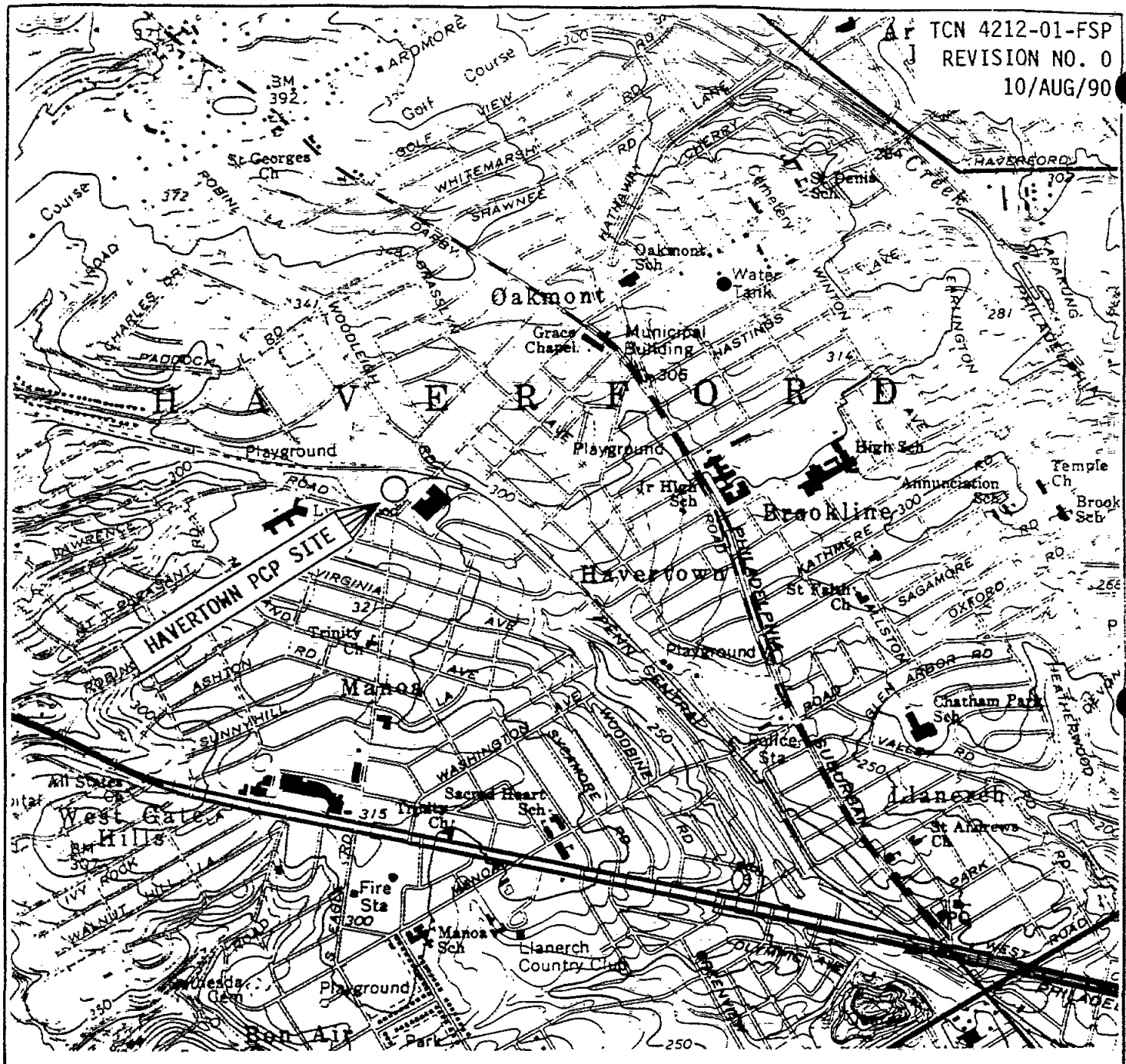

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FIGURE 2-1 AR300007
GENERAL LOCATION MAP
HAVERTOWN SITE

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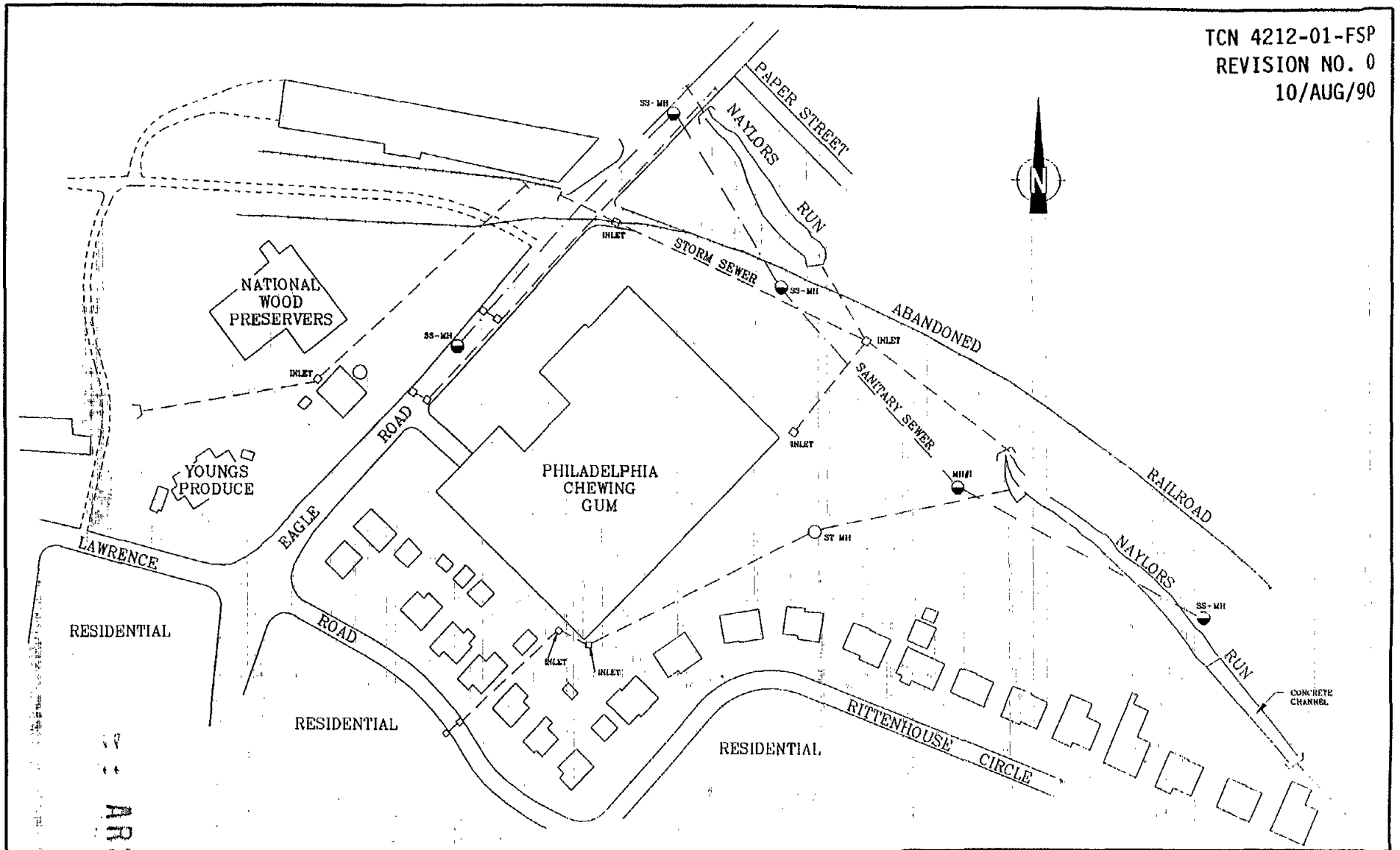

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FIGURE 2-2
SITE MAP
HAVERTOWN SITE

- Chromated Copper Arsenate (CCA) (1970's - ?);
- Chromated Zinc Chloride (CZC) (1970's - ?); and
- Tributyl Tin Oxide (TBTO) (1963 - ?).

In summary, the contaminants of concern at the HAVERTOWN site are a result of wood-treatment operations at NWP. The contaminants can be grouped into the following types of chemicals and their by-products:

- Pentachlorophenol (PCP);
- Chlorinated dioxins and dibenzofurans;
- Fuel oil and mineral spirit components;
- Heavy metals;
- Volatile organic compounds; and
- Phenols.

These contaminants have been found in the soils underlying the NWP facility, in the sediments and surface waters of Naylors Run near the catch basin, and in the ground water. Table 2-1 lists the major contaminants and their maximum concentration levels in the soils (and sediments) and water (both surface water and ground water) at the HAVERTOWN site.

Contaminant Sources and Potential Pathways of Contaminant Migration

Contamination of the ground water and soils at the HAVERTOWN site reportedly resulted from the discharge of spent wood treatment products into an injection well located in the vicinity of Young's Produce and accidental spills of such products on NWP grounds. Additionally, contamination of the

TABLE 2-1

CHEMICAL CONTAMINANTS
HAVERTOWN PCP SITE

COMPOUND	MAX SOIL CONCENTRATION	MAX WATER CONCENTRATION	CONCENTRATION IN OTHER MEDIA
INORGANICS			
Antimony	10 ug/kg		
Arsenic	6.9 mg/kg		
Chromium	22.3 mg/kg		
Barium		225 ug/l	
Beryllium		2 ug/l	
Cadmium		5.6 ug/l	
Copper	9.79 mg/kg	14 ug/l	
Lead	401 ug/kg	8.5 ug/l	
Mercury	1.8 ug/kg	0.39 ug/l	
Nickel	55 ug/kg	55 ug/l	
Silver			5.18 ng/m3 (in air)
Zinc	231 ug/kg	581 ug/l	
VOLATILE ORGANICS			
Acetone		220 ug/l	
Benzene	1.5 ug/kg	320 ug/l	
DiEthyl Phthalate			110 ng/m3 (in air)
Ethylbenzene	490 ug/kg	340 ug/l	
Toluene	390 ug/kg	230 ug/l	
Xylene	2.8 mg/kg	2400 ug/l	
SEMI-VOLATILES			
Bis-(2-Ethylhexyl) Phthalate	34 mg/kg	7.8 ug/l	
Dibenzofuran	71 mg/kg	220 ug/l	
Dioxin	0.0176 ug/kg		
Naphthalene	340 mg/kg	3800 ug/l	
PAHs (Carcinogens)	77 mg/kg	60 ug/l	
PAHs (Total)	1283 mg/kg	7400 ug/l	
CHLORINATED ORGANICS			
Chloroform	2.7 ug/kg		
1,2-Dichloroethane		37 ug/l	
1,1-Dichloroethene		21 ug/l	
1,2-Dichloroethene		720 ug/l	
Trans-1,2-Dichloroethene		52 ug/l	
Methylene Chloride	110 ug/kg	62 ug/l	
Pentachlorophenol	4500 mg/kg	13,000 ug/l	31,200 mg/kg (in oil)*
Tetrachloroethene	10 ug/kg	720 ug/l	
Trichloroethene	3.7 ug/kg	1700 ug/l	
Vinyl Chloride		11 ug/l	
PESTICIDES			
beta-Benzene Hexachloride	1300 ug/kg	18 ug/l	
Chlordane	1300 ug/kg		
Dieldrin	57 ug/kg	0.22 ug/l	

SOURCE: Tables 1 & 2, Appendix B to the Tt Work Plan, or
Tables 1-6 of the Record of Decision, unless otherwise noted.

* - Taken for the PaDER Final RI Report, 1989

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ground water may be ongoing due to the presence of free product (floating) on the water table in the vicinity of the NWP facility. Contamination of the water and sediments in Naylors Run is thought to result from contaminated ground water infiltrating a storm sewer line that discharges into Naylors Run. These contaminant sources and their potential pathways of contaminant migration are as summarized in the conceptual site model (Figure 2-3).

3.0 SAMPLING OBJECTIVES, SCHEDULE, AND PERSONNEL

Sampling Objectives

The purpose of this sampling effort at the HAVERTOWN site is to fill existing data gaps regarding potential contaminant sources and pathways, to properly assess the risk to human health and the environment associated with any contamination, and evaluate various alternative remedial technologies for the site.

The primary objective for performing Phase I field activities is to update critical information on the potential contamination of the ground water and of Naylors Run. Sampling data from the Remedial Investigation (RI) performed in 1988 by R. E. Wright Associates, Inc. provides a model for the sampling efforts. The sampling data from Phase I activities will also be used to evaluate compliance with Applicable or Relevant and Appropriate Requirements (ARARs) and will provide key parameters for the risk assessment. In addition, this information will also serve to guide the decision making process for other Phase I activities. The sampling efforts

HAVERTOWN PCP SITE
CONCEPTUAL MODEL

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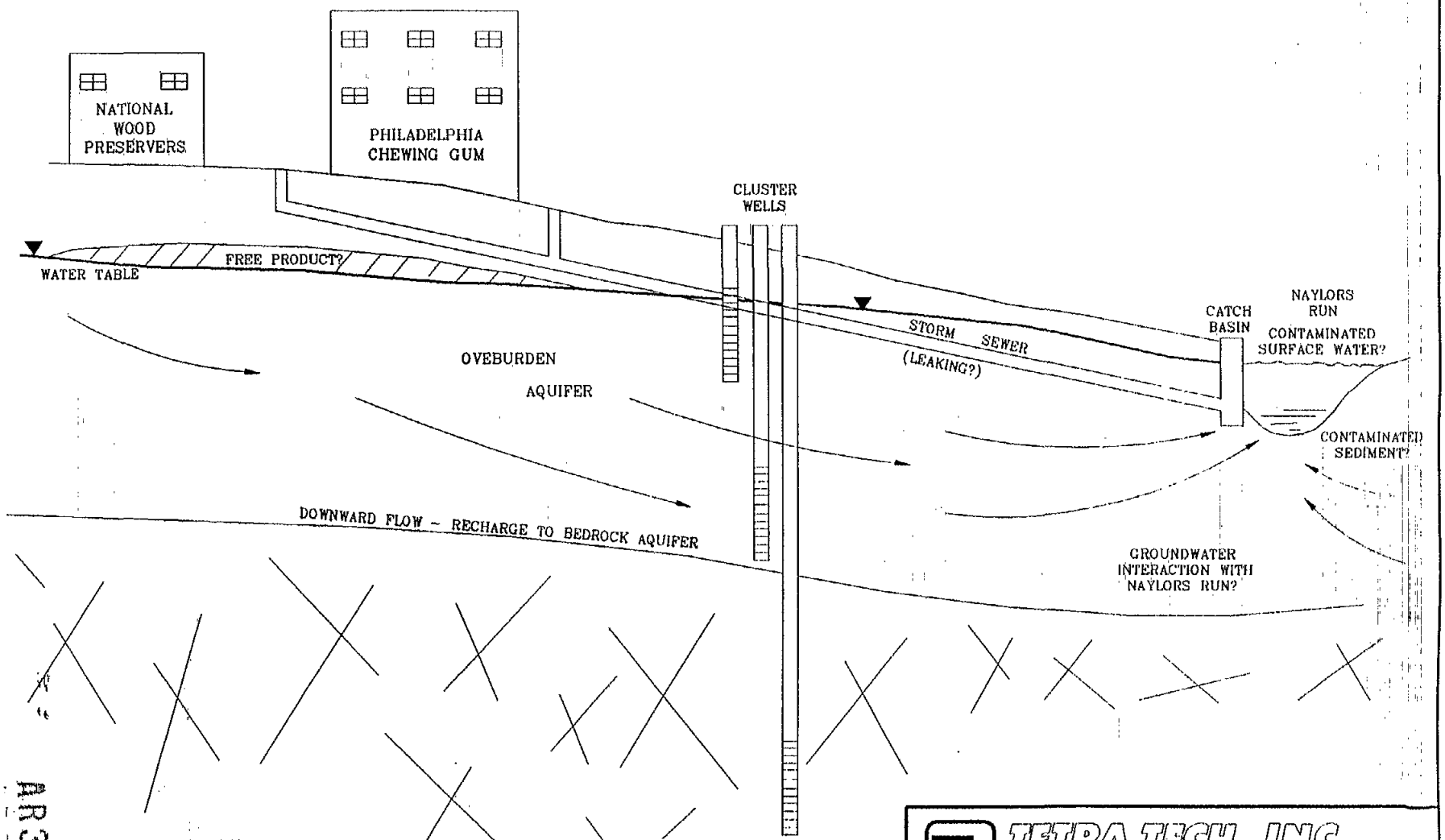

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FIGURE 2-3
CONCEPTUAL SITE MODEL
HAVERTOWN SITE

described in this Field Sampling Plan have been developed for Phase I RI activities only and shall be revised for Phase II activities, should any be required. Phase II RI activities, if initiated, will provide documentation of sediment transport and potential risk to aquatic/terrestrial life in or adjacent to Naylors Run, as well as the feasibility of free product recovery from the ground water table.

Sampling Schedule

The general schedule proposed for the RI field activities is presented in Figure 3-1. The entire field effort for the Phase I portion of this work assignment is not expected to exceed six months. All field work is dependent, of course, on generally favorable weather and field conditions, as well as subcontractor procurement and USEPA approval of all operations plans.

Project Personnel

The field activities will be performed and managed as per the field organizational chart presented in Figure 3-2. A detailed description of personnel responsibilities can be found in the QAPjP under "Project Organization and Responsibilities" (Tetra Tech, July 1990).

HAVERTOWN PCP SITE
FIELD SAMPLING PLAN

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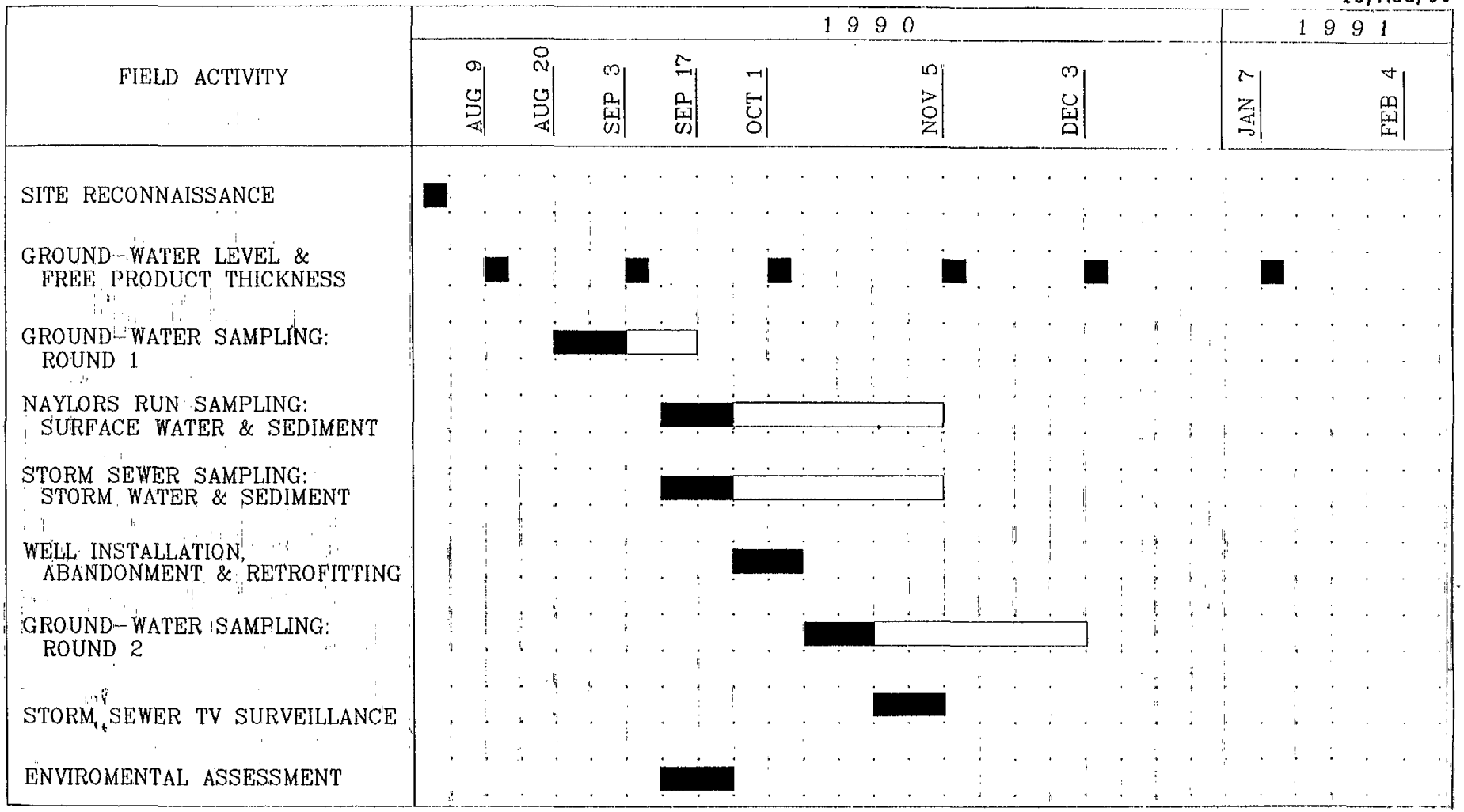

LEGEND:

FIELD ACTIVITY

LABORATORY ANALYSIS

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FIGURE 3-1
FIELD ACTIVITIES SCHEDULE
HAVERTOWN SITE

HAVERTOWN PCP SITE
FIELD ACTIVITY
PROJECT ORGANIZATION CHART

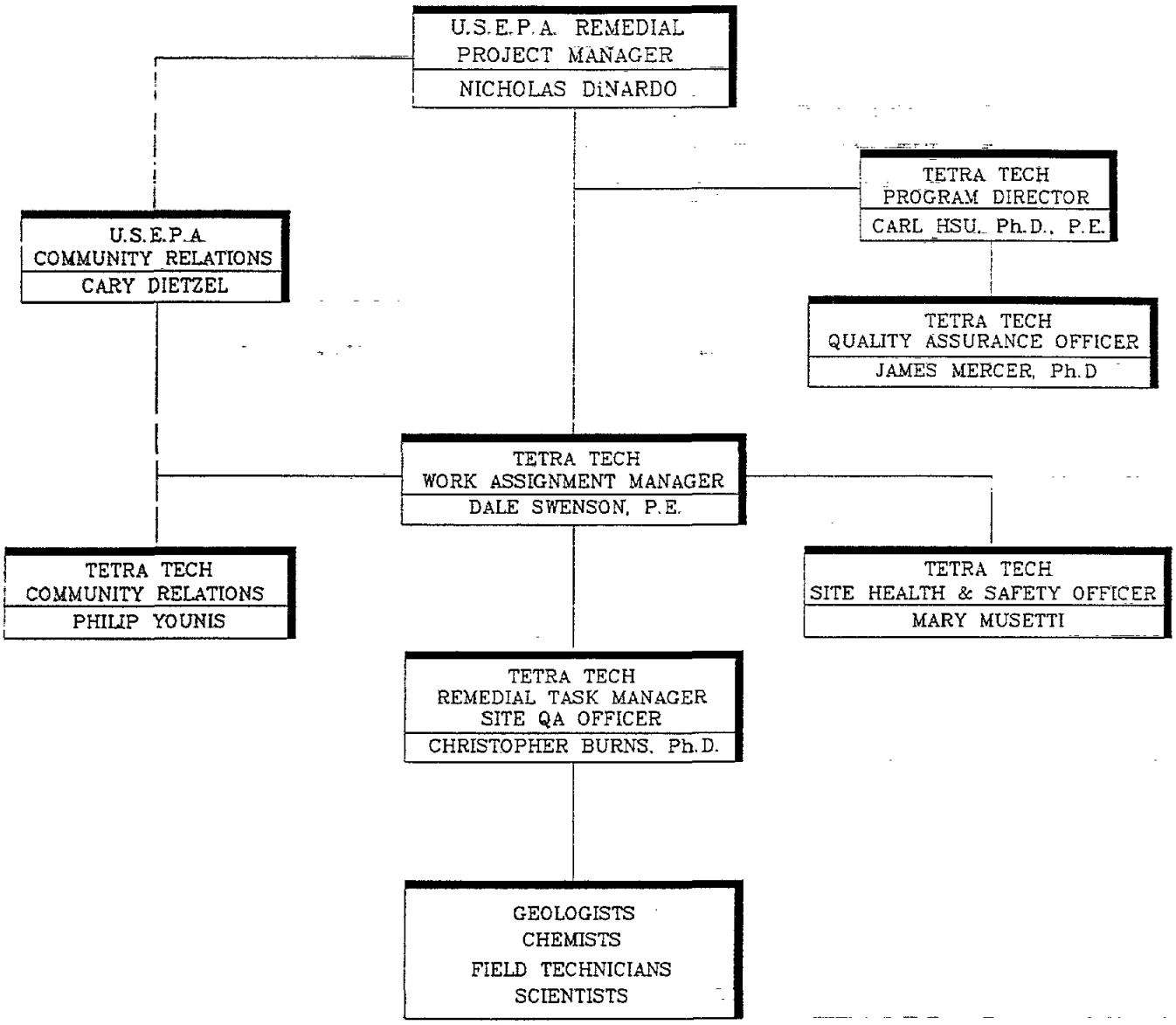

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FIGURE 3-2
FIELD ACTIVITIES PROJECT
ORGANIZATION CHART
HAVERTOWN SITE

4.0 FIELD ACTIVITIES

4.1 SITE RECONNAISSANCE

Objective - The objective of site reconnaissance is to locate and identify the condition of important site features to reduce the number of potential problems encountered during sampling activities.

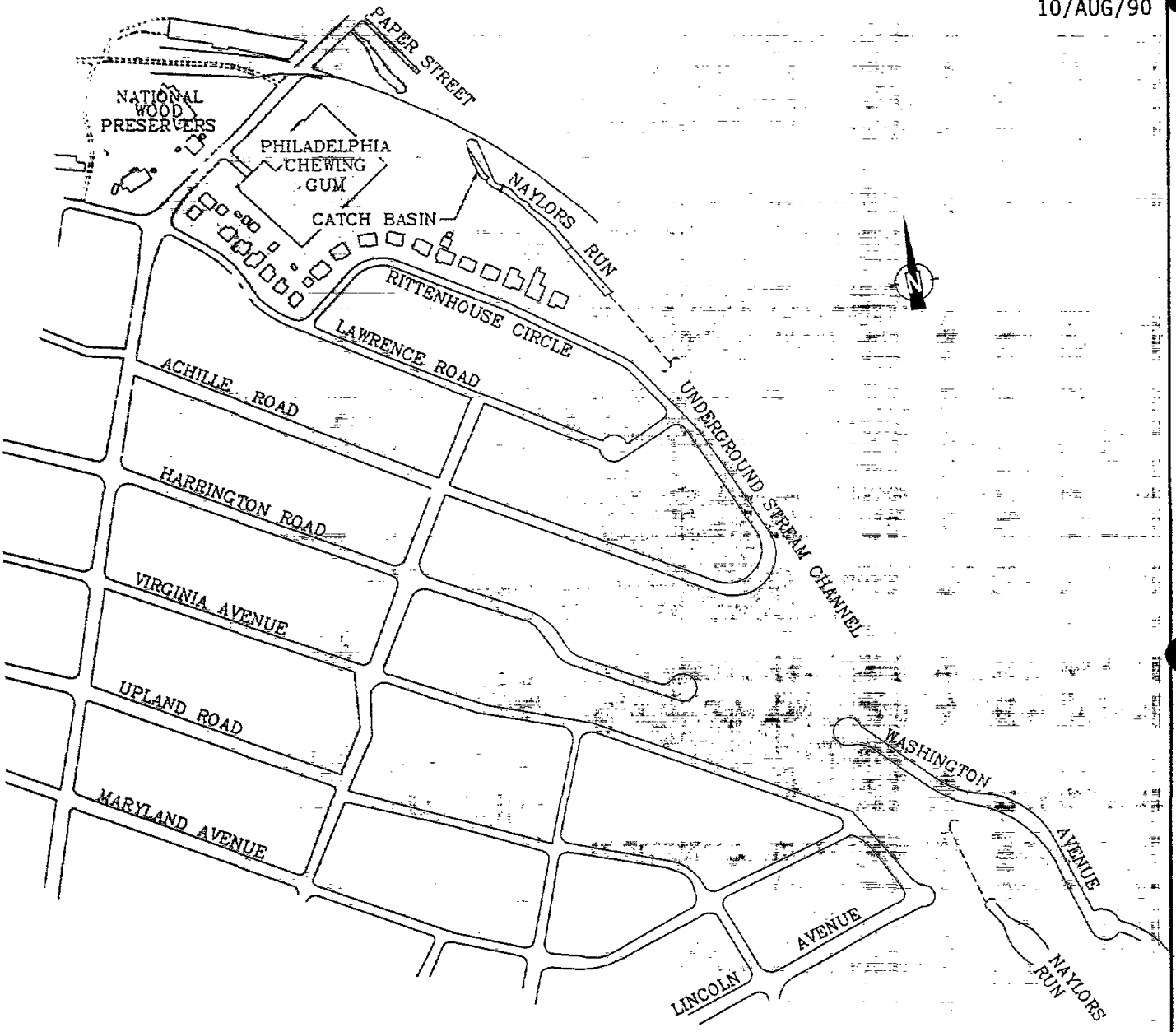
Location - The general geographic limits of the reconnaissance effort is shown on Figure 4-1.

Equipment - The equipment needed for site reconnaissance includes a large scale site map, keys to the existing wells, a set of open-end wrenches, a hammer, screw drivers, two hand picks, bolt cutters, master locks, a camera, the field log book, and the protective clothing and safety equipment listed in Table 6-2 of the HSP.

During site reconnaissance, the following tasks are to be accomplished:

1. Locate all of the 29 ground water monitoring wells to be measured and sampled (depicted in Figure 4-2) and determine accessibility to each well.

2. If wells are inaccessible due to rusted locks, the locks will be cut off using bolt cutters and replaced with new locks.



NOTE: NOT TO SCALE

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FIGURE 4-1
SITE RECONNAISSANCE
HAVERTOWN SITE

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3. The cluster wells (e.g., CW-1S, CW-1I, CW-1D) are reported to have Well Wizard pumps. Determine the presence or absence of the Well Wizards. Other wells are reported to have dedicated rigid sampling hose. Check for the presence or absence of the hose.

4. Locate the storm sewer catch basin/manholes depicted in Figure 4-8.

5. Check accessibility to each catch basin/manholes by pulling the cover or grate off at each location.

6. Six locations along Naylors Run have been targeted for surface water and sediment sampling (Figure 4-4). Scout out all locations and note any potential problems hat might hinder sampling efforts.

7. Record all observations in field log book and report to RI Task Manager.

4.2 GROUND WATER LEVEL MEASUREMENTS AND FREE PRODUCT THICKNESS IN MONITORING WELLS

Objective - The objective of measuring the ground water levels is to update the information used to calculate horizontal and vertical flow gradients which was obtained in 1988. Additionally, current water level information will be used to assess the extent of seasonal rise and fall of the water table. The objective of measuring the free product thickness is to update estimates of the horizontal extent and total volume of free floating product calculated in 1988.

Measurement Location and Frequency - The water level and free product thickness will be measured in the 29 wells depicted in Figure 4-2. Measurements will be made once per month for the first six months of the investigation. Four new wells are scheduled to be installed during the investigation. Water level and free product measurements will also be conducted in these wells after they have been installed and developed. No samples will be collected for this task.

Measurement Designation - The wells will retain their current designations (e.g., HAV-07, R-2, CW-6D, etc.).

Measurement Equipment - The equipment necessary for this task includes a site map, the field log book, an Oil Recovery System (ORS) oil/water interface probe, a key to the locks on the wells, decontamination equipment, and personal protective equipment as defined in Table 6-2 of the HSP.

Measurement Procedure - The monitoring wells field measurement procedures for this task are as follows:

1. Prior to measurement, any hoses that exist in the wells from previous investigations must be removed.

2. Switch on the ORS interface probe and verify audible indicator tone with test button. Ensure that the probe has been properly decontaminated prior to placing in well.

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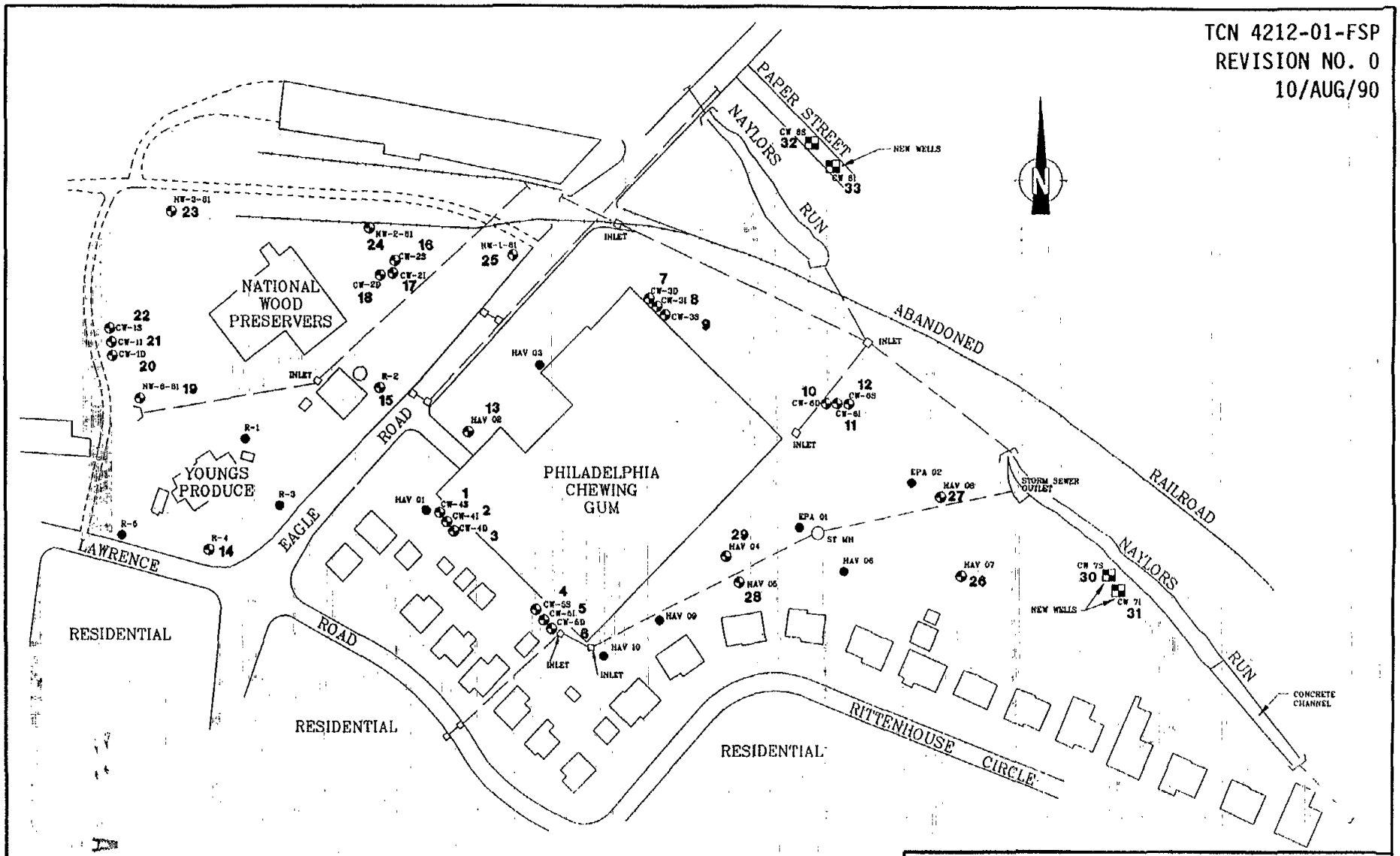

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FIGURE 4-2
WELL LOCATIONS FOR WATER LEVEL MEASUREMENT
HAVERTOWN SITE

3. Measure the depth to the top of the free product, if any, and the depth to the water surface from a surveyed reference point on the top of each well casing. Measurement should be made to the nearest 0.01 foot.

4. Properly decontaminate the probe, as described in Section 5.0.

5. Record measurements in the field log book. Refer to Section 6.0 for details on proper documentation of field activities.

4.3 MONITORING WELL SAMPLING - ROUND 1

Sampling Objective - The objective of the first round of sampling is to update information obtained in 1988 regarding the extent and magnitude of contamination in the shallow aquifer. This information will then be used to determine where additional wells are needed for proper aquifer characterization, and will ultimately be utilized for risk assessment and evaluation of remedial alternatives.

Sample Location and Frequency - At present, 29 of the existing wells have been targeted for first-round sampling. The wells will be sampled generally from east to west, beginning with well HAV-07 and ending with well R-4, or from the least contaminated well to the most contaminated well, as depicted in Figure 4-3.

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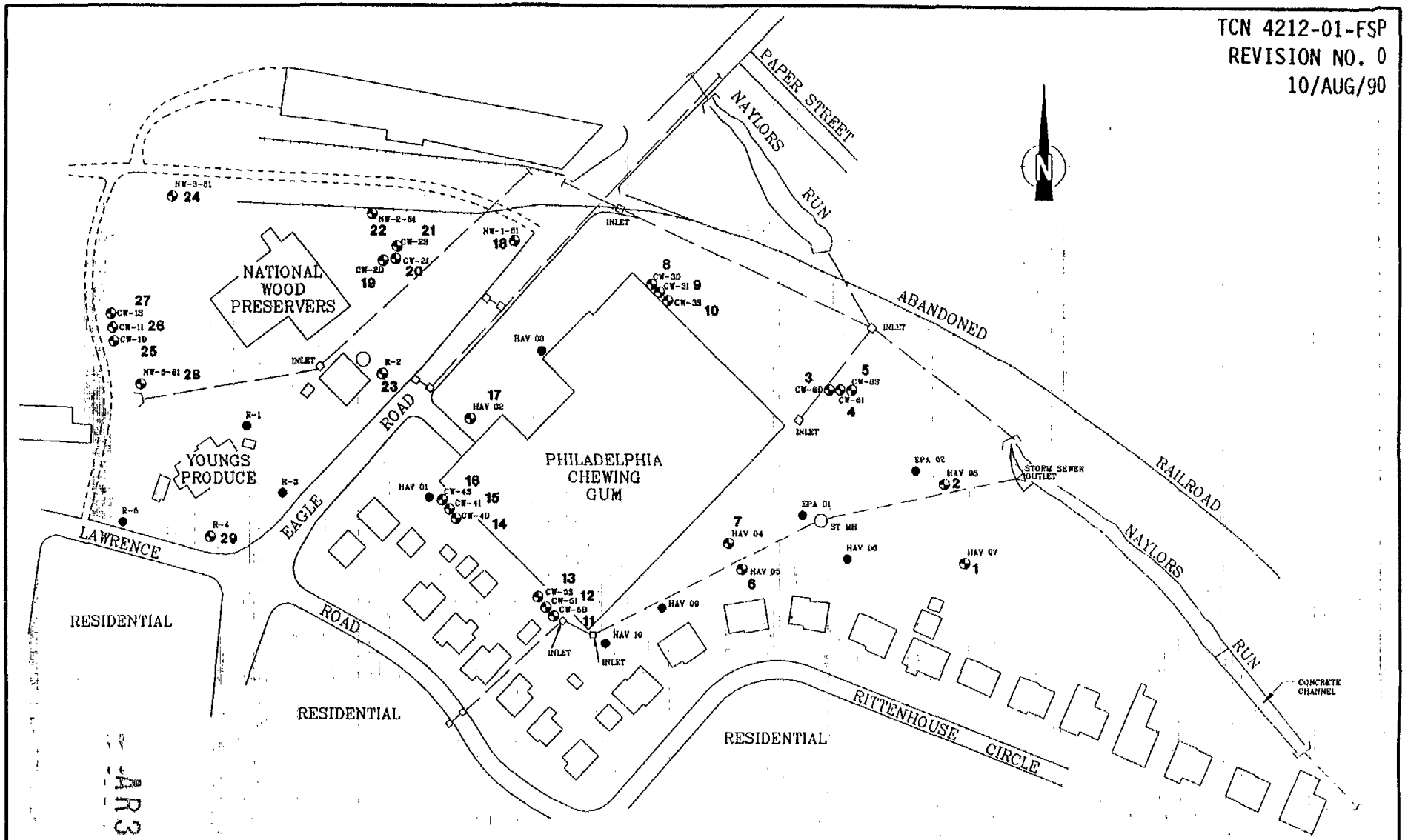

LEGEND:

- WELL LOCATIONS TO BE SAMPLED
- OTHER WELL LOCATIONS

29 SAMPLING SEQUENCE NUMBER

0 100' 200'
SCALE

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FIGURE 4-3
GROUND WATER SAMPLING LOCATIONS
ROUND 1
HAVERTOWN SITE

Sample Designation - The same well numbers used in the R. E. Wright Remedial Investigation (1988) will be used for sample identification to facilitate the comparison of the results of this round of well sampling with those in the R. E. Wright remedial investigation report. Also included will be -01 as a "sample round" identifier (e.g. HAV-07-01, R-2-01, CW-6D-01, etc.).

Sampling Equipment and Procedures - Monitoring well samples shall be collected according to the Tetra Tech Standard Operating Procedures as follows:

1. Prior to sampling, all wells shall be measured for the presence of organic vapors using a Photoionization Detector (PID) according to the procedures set forth in Appendix A. Any readings shall be noted in the field logbook, and activities shall proceed in accordance with the site HSP.

2. Using a clean, decontaminated measurement probe, determine the water level in the well; then calculate the fluid volume in the casing.

3. Using a clean, decontaminated surface pump, submersible pump or stainless steel bailer, purge the well of a minimum of three well volumes. Conductivity, pH, and temperature readings shall be taken and recorded during the well purging. The well will be considered properly purged when a minimum of three well volumes have been purged and the conductivity, pH, and temperature have stabilized.

It is important that during the lowering of the pump or bailer into the well, the pump tubing, electrical cords or rope do not come into contact with the ground.

All purged waste oil is to be collected in 55-gallon drums for later analysis and disposal. All purged water is to be discharged directly to the catch basin at Naylors Run.

4. Attach a new bailer line to a clean decontaminated stainless steel bailer equipped with a single-check valve. Check the operation of the check valve assembly to confirm free operation.

5. Lower the single check valve bailer slowly into the well until it contacts the water surface. Allow the single check valve bailer to sink with a minimum of disturbance to a point midway between the well bottom and the surface of the ground water.

6. When filled with ground water, slowly raise the bailer to the surface.

7. Tip the bailer to allow the water to slowly discharge from the top and to flow gently down the side of the sample bottle with minimum entry turbulence and aeration. First collect VOA samples, making absolutely certain that there are no bubbles adhering to the walls or the top of the VOA container. Next collect all samples for other organic analyses. Finally, collect a sample for metals analysis. All ground water samples for metals analysis will be filtered in the

field using 0.45-um acrylic copolymer filters in a prepackaged, disposable polypropylene in-line filter holder (Sample Pro assembly; Q.E.D. Environmental Systems, Inc.). A peristaltic pump will be used to pump the ground water through the in-line filter and into the sample container for metals analysis. To reduce the potential for redox reactions because of aeration, the flow rate must not exceed 100 mL/min.

8. Check that a Teflon liner is present in the cap of the sample container, if required. Secure the cap tightly.

9. Repeat Steps 4-8 as needed to fill all sample containers. Recheck that the sample collected for the analysis of volatiles does not contain headspace. If any air bubbles are present, the VOA sample must be recollected using a fresh sample container. All samples collected will be filled to the capacity required for analysis. Sample containers must not be rinsed with sample water before final filling in case of possible presence of floating products in the well, which can adhere to the sample container wall and bias the analyses.

10. Decant any remaining ground water into two clean 250-mL glass beakers. If necessary, bail additional ground water from the well. Insert the cleaned, calibrated pH/temperature and conductivity probes into the two beakers and allow the instruments to equilibrate. Record the results of each analysis in the field logbook. Return the remaining ground water back into the well.

11. Decontaminate all equipment (probes, beakers, bailers, pump, electrical cords, etc.) used during purging and sampling as per Section 5.0, Decontamination Procedures.

Sample Handling and Analysis - The samples for this first round of sampling will be analyzed for full TCL and TAL compounds by CLP laboratories. In addition to the 29 well samples collected, QA/QC samples will be collected and analyzed as per Section 7.0, QA/QC Sample Collection. A duplicate sample for each analytical parameter will be taken at wells CW-6I and CW-1I and a matrix spike and matrix spike duplicate samples for each analytical parameter will be taken at wells CW-2D and wells CW-5D. Also, as required by Section 7.0, QA/QC Sampling Collection, a trip blank to be analyzed for VOA will be taken for each day of sampling, as well as two field blanks and two equipment rinseate blanks per analytical parameter. One field blank and one equipment rinseate blank will be taken during the first day of sampling and the last day. Final handling of samples shall be as per Section 8.0, Sample Handling.

4.4 NAYLORS RUN SAMPLING: SURFACE WATER, SEDIMENT AND SEEP

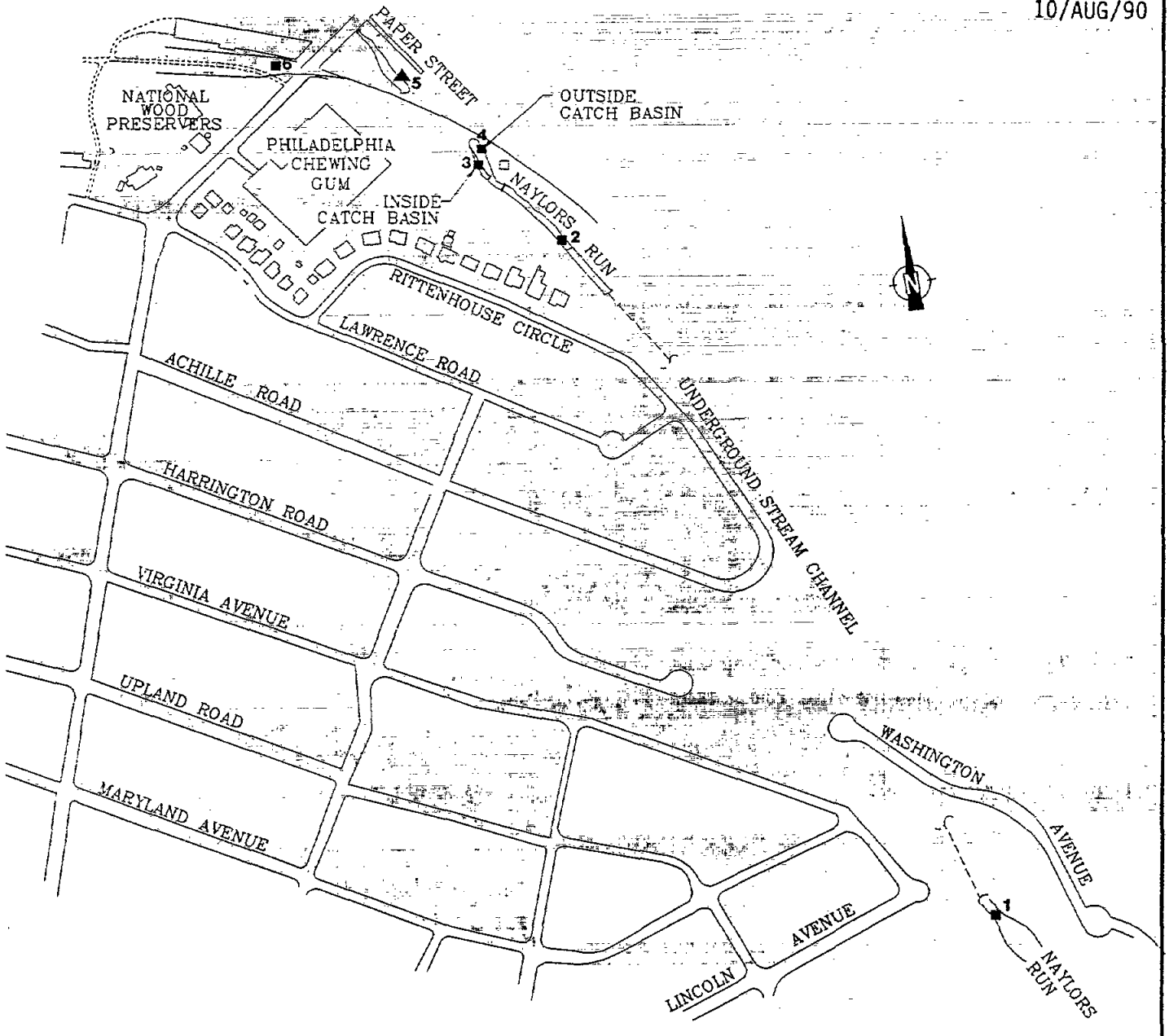
Sampling Objectives - The sampling of surface water and sediment in Naylors Run will be conducted in order to update the data base consisting of analyses of surface water and sediment samples collected in July 1987 and compiled in the September 1988 RI report by R. E. Wright Associates, Inc. The results of the sediment sampling will provide an assessment of whether contamination of the sediment is still present following the installation of the catch basin by the USEPA. In addition to sediment sampling, the seep

(Sample Location No. 5) on the east bank of Naylors Run south of Eagle Road will be sampled to assess level of contamination. These current data will ultimately be used for risk assessment evaluation. Grain size samples will also be collected to provide data regarding sediment transport, should such data be needed as part of Phase II RI/FS activities.

Sample Location and Frequency - Surface water sampling, sediment sampling and seep sampling in Naylors Run will be conducted concurrently at the same sampling locations on a one-time basis. The 6 sampling locations and sequence are shown on Figure 4-4. The first sampling location is downstream where Naylors Run emerges from subsurface channelized flow east of Virginia Avenue with the last location being upstream north of Eagle Road and east of National Wood Preservers.

Sample Designation

The following sample designation system will be employed: HV-NAY-SED-01 through 07 for sediment samples; and HV-NAY-AQ-01 through 07 for surface water (aqueous) samples. The letters HV identify the site; the letters NAY identify Naylors Run; the letters SED or AQ identify the sample matrix, and the numerals 01 through 07 identify the sampling locations (07 will be used for the duplicate sample collected at location #2). Since this sampling is a one-time event, no "sample round" identifier is required.



NOTE: NOT TO SCALE

LEGEND:

- ■ SEDIMENT AND SURFACE SAMPLING LOCATIONS
- ▲ SEEP AND SURFACE SAMPLE LOCATION
- 6 SAMPLING SEQUENCE NUMBER

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FIGURE 4-4
NAYLORS RUN SAMPLING
SURFACE WATER & SEDIMENT
HAVERTOWN SITE

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Sampling Equipment and Procedures

A. General Procedures

An integrated sediment sampling and surface water sampling effort shall be performed at each sampling location shown in Figure 4-4, with the surface water sample collected first, followed by the collection of the sediment sample. Sampling will occur from downstream to upstream, proceeding in an increasing numerical order from sampling location #1 (with the exception of the #2 duplicate, which is to be labeled #7). Field sampling personnel will collect the samples from areas of stream bottom where there is predominantly fine-grained sediment. These areas should also be characterized by a steady, but non-turbulent, flow of water. These criteria are designed to maximize sample quality by maximizing the adsorption of metals and organics in the sediments and the retention of volatile constituents in the water column, respectively.

One team member will perform the actual sample collection; he will carefully adopt an optimal sampling position, and once in that position, will not move his feet until all sampling at that locality is concluded in order to minimize agitation of the sediment and water. The other team member will be positioned within arms-length of the sampler on dry ground, and will perform field measurements, fill sample bottles, and document the collection effort in the field logbook.

Both the samples and the work zone airspace will be monitored during sampling for the presence of VOC's, using a precalibrated PID or OVA. The results of VOC screening will be contained in the field logbook, as well as a detailed description of the sampling location (including distances from marker features, if any) and procedures. The handling of the collected samples will proceed as per Sample Handling.

B. Surface Water Sampling Procedures

A field sampling team clad in rubber protective over-boots and gloves will select and proceed to the collection locality. At each sampling location a laboratory-clean collection jar will be used for sampling. The jar will be triple-rinsed with stream water then lowered into Naylors Run a fourth time to obtain actual sample volume. When the jar is filled it will then be removed from the stream and tested for the required field parameters.

Field measurements of pH, specific conductance, and temperature will be obtained for each sample of surface water collected as per Tetra Tech S.O.P. (Appendix A). Field parameter measurements will be recorded on data tables in the field logbook.

Following the measurements of field parameters, the samples will be transferred from the collection jar to the sample bottles. Surface water samples will not be filtered. Special care will be taken regarding the volatiles sample, which will be poured very slowly down the side of the bottle (in order to minimize entrainment of air and

loss of volatiles) and inverted to ascertain the absence of bubbles in the sample. If bubbles are present, the sample will be discarded and recollected.

This procedure will be repeated until all specified sample bottles have been filled at that locality. Stream sediments are to remain undisturbed by the sampling jar. Should contact with the bottom and resuspension of sediment occur, the sampling team is to halt sampling until the water has cleared. If the water does not clear within a few minutes, the team is to proceed slightly upstream (about 1 meter or just above the disturbed area) and resume the sampling effort.

Upon completion of the water sampling at a given locality, the used collection jar and nylon cord will be placed in a plastic bag for disposal. The team sampler will remain in position for the sediment sampling effort.

C. *Sediment and Seep Sampling in Naylors Run*

Samples of sediment from depths of 0 to 6 inches will be collected from Naylors Run at the same localities as the surface water samples except Location #5, which will be the seep sample location. Six large stainless-steel scoops, 1 for each sample locality, will be cleaned by Tetra Tech prior to going to the site using an Alconox scrub, a tap water rinse, a rinse with deionized water, and a final nitric acid solution rinse. The scoops will be air dried, then sealed in individual plastic bags for transport to the HAVERTOWN site.

At the site, a dedicated scoop will be used at each locality to collect sediment to fill the appropriate sample jars for TCL/TAL, dioxin, and grain size analysis. When all the sample jars have been filled, the scoop will be rinsed in the stream to remove particulates, then placed in the plastic bag containing the surface water collection jar and nylon cord. After all the samples have been properly deposited in a cooler, the sampling gloves and boots will also be placed into the plastic trash bag.

D. Decontamination Procedures

Decontamination of sampling equipment between each sampling location is not required, due to the use of dedicated sampling devices. To prevent the potential spread of surface contaminants from the sampling localities, all sampling devices and personal protective equipment (gloves, boot covers, etc.) are to be sealed in a plastic bag prior to leaving the locality. At subsequent sample locations, new personal protective equipment will be used. At the conclusion of the sampling effort, all six plastic bags will be disposed of in an on-site drum.

Sample Handling and Analysis - The surface water samples will be analyzed by CLP laboratories for all TCL/TAL compounds, as well as, dioxin, dibenzofuran, and their isomers. Sediment and seep samples will also be analyzed for all TCL/TAL compounds, dioxin, dibenzofuran and their isomers, as well as grain size. In addition to the six sample locations for each sample matrix, a seventh duplicate sample of each matrix from Location #2 will be taken for QA/QC purposes. As required

per Section 7.0, QA/QC Sampling Collection, one matrix spike and matrix spike duplicate sample for the TCL, TAL, and dioxin analysis for each matrix will be taken at Location #4. Also, one trip blank per matrix to be analyzed for VOA will be taken, as well as one field blank and one equipment rinseate blank per analysis (TCL, TAL and dioxin) per matrix.

The use of dedicated sample collection devices nullifies the need to sample rinseate from the equipment decontamination procedure. Instead, deionized water will be run over the "clean" sampling devices at Location #1 (1 sample collection jar and 1 scoop) prior to their use, as a test of their integrity. The deionized water will be collected and designated as the equipment rinseate blank.

For the dioxin/dibenzofuran analysis, a Performance Evaluation (PE) sample will be supplied to Tetra Tech for each matrix by the EPA Regional Sampling Control Center (RSCC). The PE samples will accompany the field sampling containers to the site and then be shipped to their respective laboratory for analysis.

4.5 STORM SEWER SAMPLING: STORM WATER & SEDIMENT

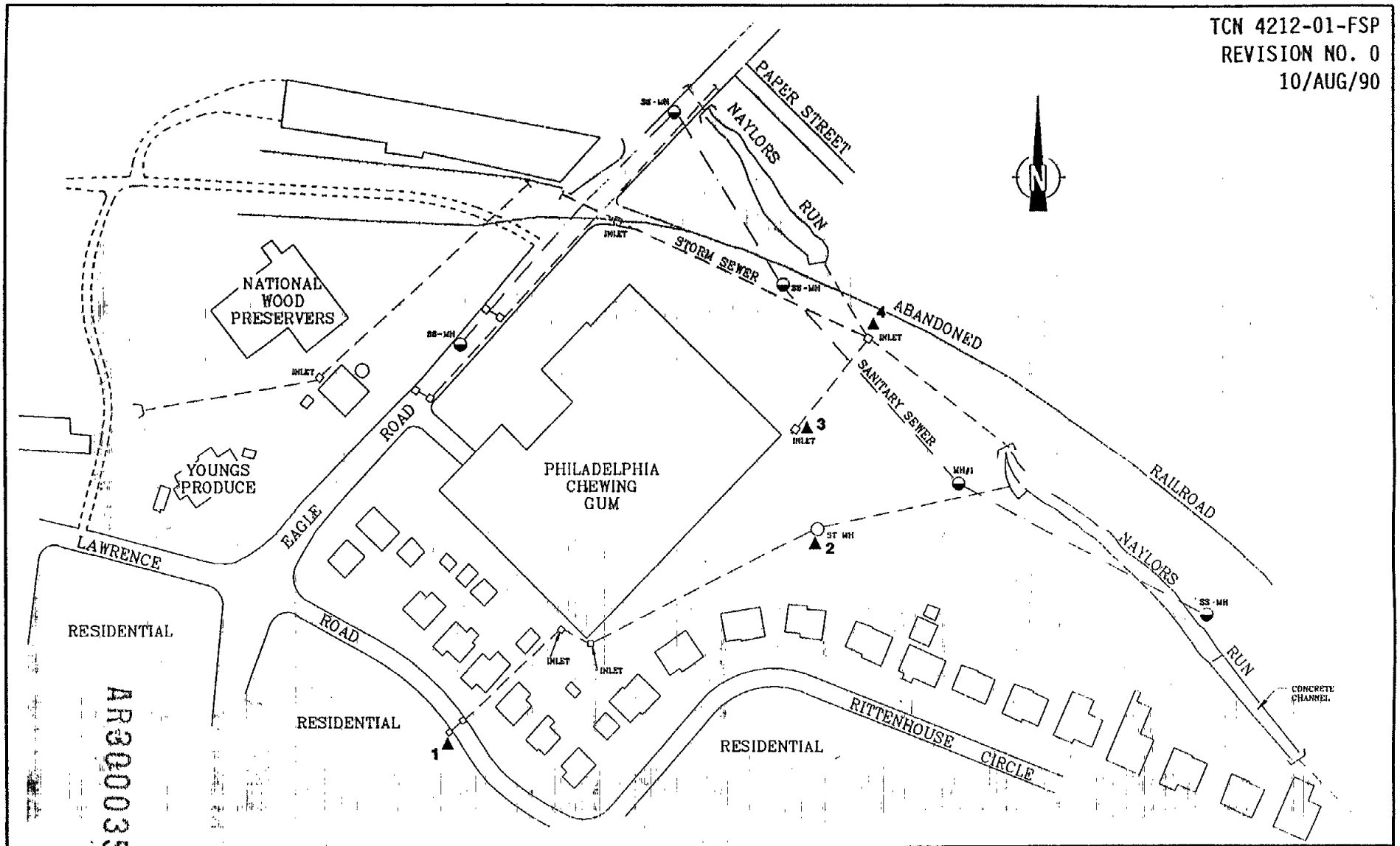
Sampling Objectives - The objective of sampling the storm water and sediment in the catch basins/manholes of the two existing storm sewer systems located in the backyards of the residents along Rittenhouse Circle and in the north parking lot of the PCG facility is to determine any entry points for contamination into the storm sewer. These current data will be used to

determine risk assessment evaluation, if any sections of the sewer should be replaced, and if any inflow problems exist.

Sample Location and Frequency - Storm water sampling in the existing storm sewer systems will be performed during Tetra Tech normal working hours after a rainfall event greater than ½ inch to ensure that there is sufficient water volume for sampling purposes. Sediment sampling will occur concurrently with the Naylors Run surface water and sediment sampling event. Sampling at each location will occur on a one-time basis. The 4 sampling locations and sequence are shown on Figure 4-5. The first sampling location is the inlet catch basin on Rittenhouse Circle. The last location will be the inlet catch basin where the PCG's storm sewer system discharges into the section of Naylors Run that has been replaced with underground pipe.

Sample Designation

The following sample designation system will be employed: HV-SS-SED-01 through 05 for sediment samples; and HV-SS-AQ-01 through 05 for storm water (aqueous) samples. The letters HV identify the site; the letters SS identify the storm sewer; the letters SED or AQ identify the sample matrix, and the numerals 01 through 05 identify the sampling locations (05 will be used for the duplicate sample collected at location #2). Since this sampling is a one-time event, no "sample round" identifier is required.



LEGEND:

- ▲ SAMPLING POINTS FOR STORM SEWER (SEDIMENT AND WATER)
- 1 SAMPLE SEQUENCE NUMBER
- — — SANITARY SEWER
- — — — STORM SEWER

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FIGURE 4-5
STORM SEWER SAMPLING:
STORM WATER & SEDIMENT
HAVERTOWN SITE

Sampling Equipment and Procedures

A. General Procedures

A sediment sampling and storm water sampling effort shall be performed at each sampling location shown in Figure 4-5. Field sampling personnel will collect the samples from bottom of the catch basin/manhole where there is predominantly fine-grained sediment. This criteria is designed to maximize sample quality by maximizing the adsorption of metals and organics in the sediments and the retention of volatile constituents in the storm water.

Both the samples and the work zone airspace will be monitored during sampling for the presence of VOC's, using a precalibrated PID or OVA. The results of VOC screening will be contained in the field logbook, as well as a detailed description of the sampling location (including distances from marker features, if any) and procedures. The handling of the collected samples will proceed as per Sample Handling.

B. Storm Water Sampling Procedures

A field sampling team clad in rubber protective over-boots and gloves will select and proceed to the collection locality. At each sampling location a laboratory-clean collection jar will be used for sampling. If possible, the sampling team member should not enter the manhole. The jar will be triple-rinsed with storm water then lowered into the catch basin/manhole a fourth time for collection of the actual sample

volume. When the jar is filled it will be removed from the catch basin/manhole and tested for field parameters.

Field measurements of pH, specific conductance, and temperature will be obtained for each sample of surface water collected as per Tetra Tech S.O.P. (Appendix A). Field parameter measurements will be recorded on data tables in the field logbook.

Following the measurements of field parameters, the samples will be transferred from the collection jar to the sample bottles. Storm water samples shall not be filtered. Special care will be taken regarding the volatiles sample, which will be poured very slowly down the side of the bottle (in order to minimize entrainment of air and loss of volatiles) and inverted to ascertain the absence of bubbles in the sample. If bubbles are present, the sample will be discarded and recollected.

This procedure will be repeated until all specified sample bottles have been filled at that locality. During storm water sampling any existing sediments in the catch basin/manhole are to remain undisturbed by the sampling jar. Should contact with the sediments occur the sampling team is to halt sampling until the water has cleared.

Upon completion of the water sampling at a given locality, the used collection jar and nylon cord will be placed in a plastic bag for disposal.

C. Storm Sewer Sediment Sampling

Samples of sediment will be collected from the bottom of the catch basin/manhole at the same 4 localities as the storm water samples. Four large stainless-steel scoops, 1 for each sample locality, will be cleaned by Tetra Tech prior to going to the site using an Alconox scrub, a tap water rinse, a rinse with deionized water, and a final nitric acid solution rinse. The scoops will be air dried, then sealed in individual plastic bags for transport to the HAVERTOWN site.

At the site, a dedicated scoop will be used at each locality to collect sufficient quantity of sediment to fill the appropriate sample jars for TCL/TAL analysis. When all the sample jars have been filled, the scoop will be rinsed in with distilled water to remove particulates, then placed in the plastic bag containing the surface water collection jar and nylon cord. After all the samples have been properly deposited in a cooler, the sampling gloves and boots will also be placed into the plastic trash bag.

D. Decontamination Procedures

Decontamination of sampling equipment between each sampling location is not required, due to the use of dedicated sampling devices. To prevent the potential spread of surface contaminants from the sampling localities, all sampling devices and personal protective equipment (gloves, boot covers, etc.) are to be sealed in a plastic bag prior to leaving the locality. At subsequent sample locations, new personal

protective equipment will be used. At the conclusion of the sampling effort, all six plastic bags will be disposed of in an on-site drum.

Sample Handling and Analysis - The storm water samples will be analyzed by CLP laboratories for all TCL/TAL compounds, as well as, dioxin, dibenzofuran, and their isomers. Storm sewer sediment samples will only be analyzed for all TCL/TAL compounds. In addition to the four sample locations for each sample matrix, a fifth duplicate sample of each matrix from Location #2 will be taken for QA/QC purposes. As required per Section 7.0, QA/QC Sampling Collection, one matrix spike and matrix spike duplicate sample for the TCL, TAL, and dioxin analysis for each matrix will be taken at Location #4. Also, one trip blank to be analyzed for VOA will be taken, as well as one field blank and one equipment rinseate blank per analysis (TCL, TAL and dioxin) per matrix.

The use of dedicated sample collection devices nullifies the need to sample rinseate from the equipment decontamination procedure. Instead, deionized water will be run over the "clean" sampling devices at Location #1 (1 sample collection jar and 1 scoop) prior to their use, as a test of their integrity. The deionized water will be collected and designated as the equipment rinseate blank.

For the storm water dioxin/dibenzofuran analysis, a Performance Evaluation (PE) sample will be supplied to Tetra Tech by the EPA Regional Sampling Control Center (RSCC). The PE samples will accompany the field sampling containers to the site and then be shipped to the laboratory for analysis.

4.6 WELL INSTALLATION/ABANDONMENT/RETROFITTING

WELL INSTALLATION

Objective - Four additional ground water monitoring wells will be installed adjacent to Naylors Run in order to provide additional downgradient information on the extent of ground water contamination and to determine more precisely the interaction between ground water flow and base flow in Naylors Run.

Well Location and Frequency - Two cluster pairs of ground water monitoring wells are proposed to be installed adjacent to Naylors Run. One pair is proposed to be located east of well HAV-07 (Figure 4-6). The second pair is proposed to be located on the northeast side of the abandoned railroad and Naylors Run. Actual location of the wells will be determined after the first round of ground water sample results have been analyzed.

Well Designation - The first pair of cluster wells, located east of well HAV-07, will be designated CW-7. The second pair, located on the northeast side of the abandoned railroad and Naylors Run, will be designated CW-8.

Well Equipment and Procedures - The equipment needed for installation of wells at the site is summarized in Table 4-1.

Drilling will be performed by a licensed drilling firm under the direction of Tetra Tech. The drilling field crew will consist of a driller, a driller's assistant, and a Tetra Tech field geologist. The field geologist

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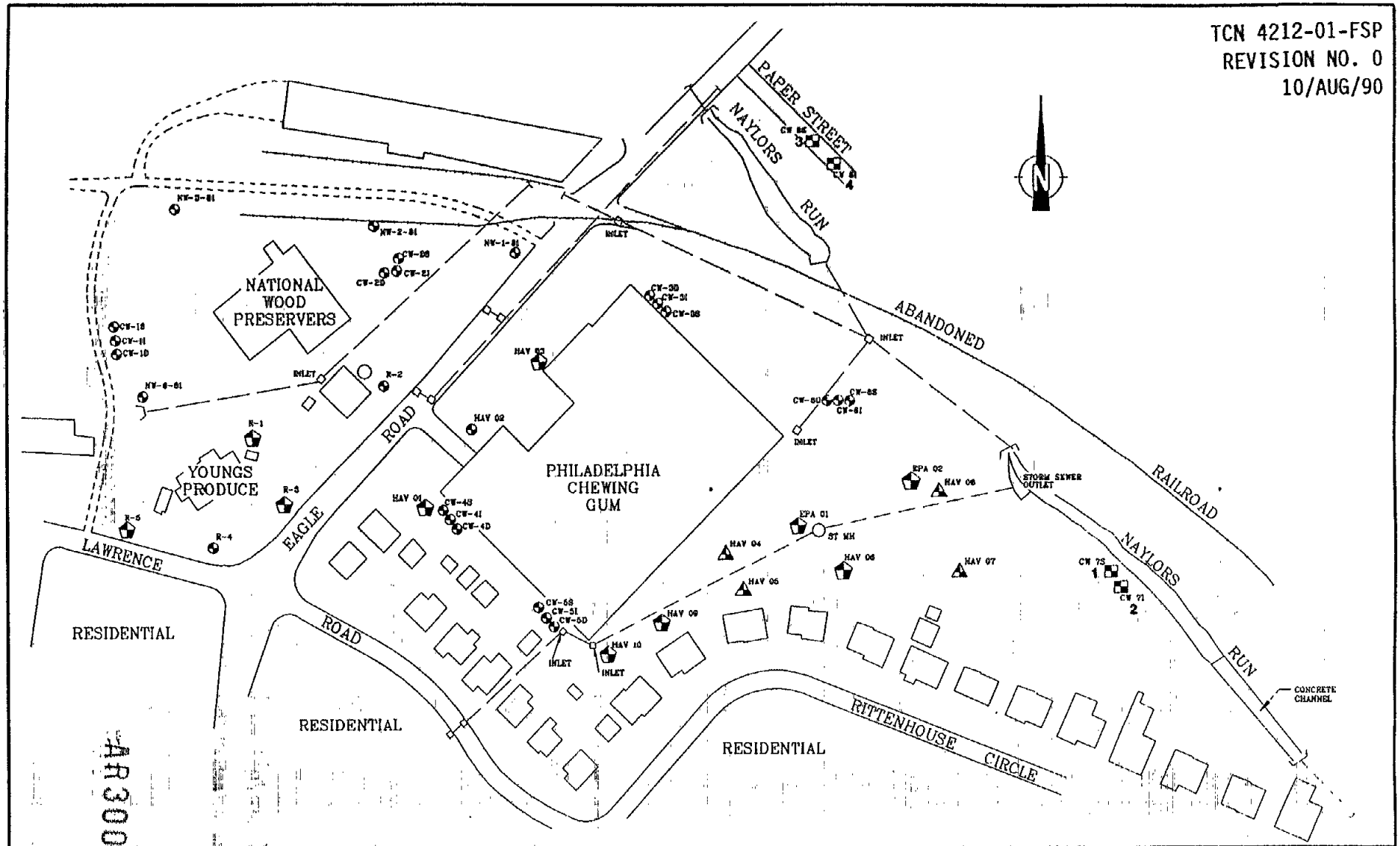

LEGEND:
- WELLS TO BE DRILLED
- WELLS TO BE RETROFITTED
- WELLS TO BE ABANDONED
- 4 DRILLING SEQUENCE NUMBER
- EXISTING WELL LOCATIONS
- OTHER WELL LOCATIONS

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FIGURE 4-6
GROUND WATER MONITORING
WELL LOCATIONS
HAVERTOWN SITE

TABLE 4-1

EQUIPMENT NEEDED FOR INSTALLATION OF BOREHOLES AND GROUND-WATER MONITORING WELLS

Equipment to be Supplied by Driller

Hollow-stem auger
Split-barrel samplers
Alternate sampling devices
4-inch I.D. PVC casing and end caps
4-inch I.D. PVC screen (0.010 inch slot size)
6-inch locking surface steel protector cap

Cement
Bentonite
#2 Morie sand

Bore brush
Water truck (if needed)
Stainless steel tape (100 feet)
Tremie pipe

55-gallon drums
Steam cleaner
Generator for steam cleaner
Shovels

Additional Equipment to be Supplied by Tetra Tech

Foxboro Organic Vapor Analyzer
Camera and film
Rock hammer
Site map
Fiberglass tape (100 feet)
Personnel safety equipment
Field vehicle
Decimal tape measures
Plastics bags
Chain-of-custody forms
Brushes (for decontamination)
Dilute HC1 in dropper bottle

Padlock and keys
Solvent squirt bottle
Oil Recovery Systems interface probe
Shovels
Munsell soil color chart
Grain size chart
battery (2)
Field logbook
Indelible felt pens
Stainless steel trowel
Sample tags

will supervise drilling operations and conduct the geologic logging of the boreholes.

The wells will be drilled with a hollow-stem auger drilling rig using an 8-inch outside diameter augers. The wells in each pair will be placed approximately 15 feet apart. During drilling operations, continuous split-spoon samples will be collected. The samples will be described by a geologist and then placed in sealed glass jars. These samples will then be screened for VOC's with an organic vapor analyzer (OVA) after coming to room temperature.

The following procedures will be followed regarding the drilling of the wells:

1. Prior to drilling any water source used in drilling or decontamination shall be analyzed to determine absence of contaminants.

2. The drilling rig and sampling equipment shall be decontaminated by steam-cleaning (high pressure, hot water) prior to drilling. All "decontamination water" will be contained in 55-gallon drums.

3. Drilling progress and information about the formations encountered shall be recorded by the geologist on the geologic log. The geologist, using standard geologic logging techniques, shall record the depths and thickness of strata, color (using a color chart), grain size and approximate distribution, sample recovery, penetration

resistance, moisture content, and other pertinent data. The locations of chemical deposits and zones of weathering or chemical reaction shall be noted.

4. The air space surrounding the borehole shall be scanned with an OVA during all drilling activities to determine the absence of volatile organic compounds. Results of this air monitoring shall be recorded in the field logbook. Activities shall proceed according to the site HSP if the presence of volatile organic compounds is indicated.

5. All well casing and screens shall be decontaminated (steam-cleaned) prior to installation in the borehole. Contact of casing or screen with the ground prior to installation shall be avoided. Plastic sheeting (e.g., visqueen) shall be placed on the ground and used as a cover to protect stockpiled materials from contamination.

6. The geologist shall also record information on depth drilled, problems with borehole advancement, fill materials encountered, and water levels. For all completed wells, the depth of casing and screened intervals, and all annular seals, packing, and grouts shall be recorded on the well completion log.

7. Between boreholes, the down-hole drilling tools shall be steam-cleaned.

8. All borehole cuttings shall be collected in a 55-gallon waste storage drum.

All the wells will be surveyed, developed, and purged prior to any sampling.

The wells will be constructed in a manner consistent with the other wells previously installed on site. One well from each pair will be screened across the water table; the second well will be screened immediately above the bedrock/overburden interface. All wells shall be constructed of 4-inch PVC, and are estimated to range from 15 to 35 feet in total depth.

All monitoring wells will have screened intervals 10 feet in length. The screen slot size will be 0.010 inch for all wells. The screen will be constructed of machine slotted PVC for all wells. An annular sand pack composed of washed #2 Morie sand will be installed in each well from the base of the screen to two feet above the screened interval using a tremie pipe. A bentonite pellet seal will extend two feet above the sand pack, and will be tamped into place. All annular packs and seals will be measured using a stainless steel tape. All well measurements will be recorded in the field logbook. The remaining annulus to the ground surface will be filled with a cement-bentonite grout [not to exceed 14.2 pounds/gallon (less than 5 percent bentonite)] using a tremie pipe. All wells shall terminated at grade with a 12-inch diameter curb box around the well casing. The curb box will be encased in concrete and extend approximately 1-inch above grade. Inside the curb box the well casing shall be fitted with a lockable water-tight cap.

Well development shall be performed to remove clay, silt, and sand that is already in the well, and to remove clay and silt found in the filter pack

surrounding the well. Well development ensures free movement of water from natural subsurface materials into the well.

The wells will be developed by mechanically surging the screened portion of the well with a decontaminated, 5-foot long, surge block, constructed of stainless-steel rod and pipe, with five 3-1/2 inch diameter rubber washers spaced equidistantly along the length of the surge block. The surging will be accomplished by attaching a rope to the top of the surge block and manually pulling the rope through a pulley mounted on a tripod, centered over the well casing. Each well will be surged along the entire length of the screen for a total of 20 to 25 minutes.

After the completion of mechanical surging, the monitoring wells will be purged of a minimum of three well volumes and/or until the discharge water is clear.

WELL ABANDONMENT

Approximately 10 wells on the site are of no current or future use for any investigation. Therefore, to minimize the possible migration of surface contamination into the ground water, the wells are to be properly abandoned.

Objective - The wells shall be abandoned (filled) such that they will not produce water, nor act as a conduit for the interchange of waters of undesirable quality with those whose quality is desirable, nor present a hazard to public health or the environment.

Well Locations - Monitoring wells EPA-01, EPA-02, HAV-01, HAV-03, HAV-06, HAV-09, HAV-10, R-1, R-3, and R-5 will be abandoned.

Equipment and Procedures

1. To ensure that sealing materials fill the well casing and any annular space or voids, the well casing shall be removed in its entirety.

2. The borehole shall be redrilled to remove any existing obstructions (filter packs, possible broken-off sections of the well casing, etc.) which could interfere with the filling and sealing process.

3. Collect all cuttings and place them in a 55 gallon storage drum.

4. The borehole shall be filled with appropriate sealing or filling materials (concrete, Portland cement grout, sodium-based bentonite clay, or combinations of those materials) using a tremie pipe to pressure grout the well from the bottom upward.

5. Within 30 days of abandonment of a well, the contractor must submit a completed Pennsylvania Department of Environmental Resources (PADER) well abandonment report to the PADER. The report must be completely filled out and signed by the on-site supervisory contractor/driller/driver.

WELL RETROFITTING

Objective - Presently, a number of wells located in the backyards of local residents have stick-up casings. These wells will be retrofitted with flush-to-grade protective curb boxes to reduce any physical hazard associated with the stick-up casings.

Well Locations - Monitoring Wells HAV-04, HAV-05, HAV-07, and HAV-08 will be retrofitted.

Well Equipment and Procedures - The wells will be retrofitted by a drilling subcontractor under the supervision of Tetra Tech. The following procedures will be followed:

1. Remove grout around the PVC well casing to a depth of 2 feet below grade and within an 18-inch radius of the well.

2. Cut the PVC well casing off 3 inches below grade.

3. Center the curb box (12-inch diameter) around the well casing. The top of the curb box should be approximately 1 inch above grade.

4. Pour concrete in the annular space around the curb box.

5. Use a masonry trowel to smooth out the concrete, such that its surface slopes from the top of the curb box to ground surface.

6. Inside the curb box the well casing shall be fitted with a lockable water-tight cap.

7. Secure the top on the curb box.

4.7 MONITORING WELL SAMPLING - ROUND 2

Sampling Objective - The objectives of the second round of ground water sampling are to confirm the results of first round of sampling to provide ground water data for the newly installed cluster wells, and to provide necessary data for risk assessment.

Sample Location and Frequency - The same wells sampled in Round 1 will be sampled again. Additionally, the new cluster wells (CW-7I, CW-7S, CW-8I, and CW-8S) will be sampled. Sampling sequence will be as depicted on Figure 4-7.

Sample Designation - The samples will retain their original designations. To distinguish between the first and second round of sampling, the sample identification will include the -02 "sample round" identifier (e.g., HAV-07-02, R-2-02, CW-6D-02, etc.).

Sampling Equipment and Procedures - This task will require the equipment and procedures as described in Section 4.3.

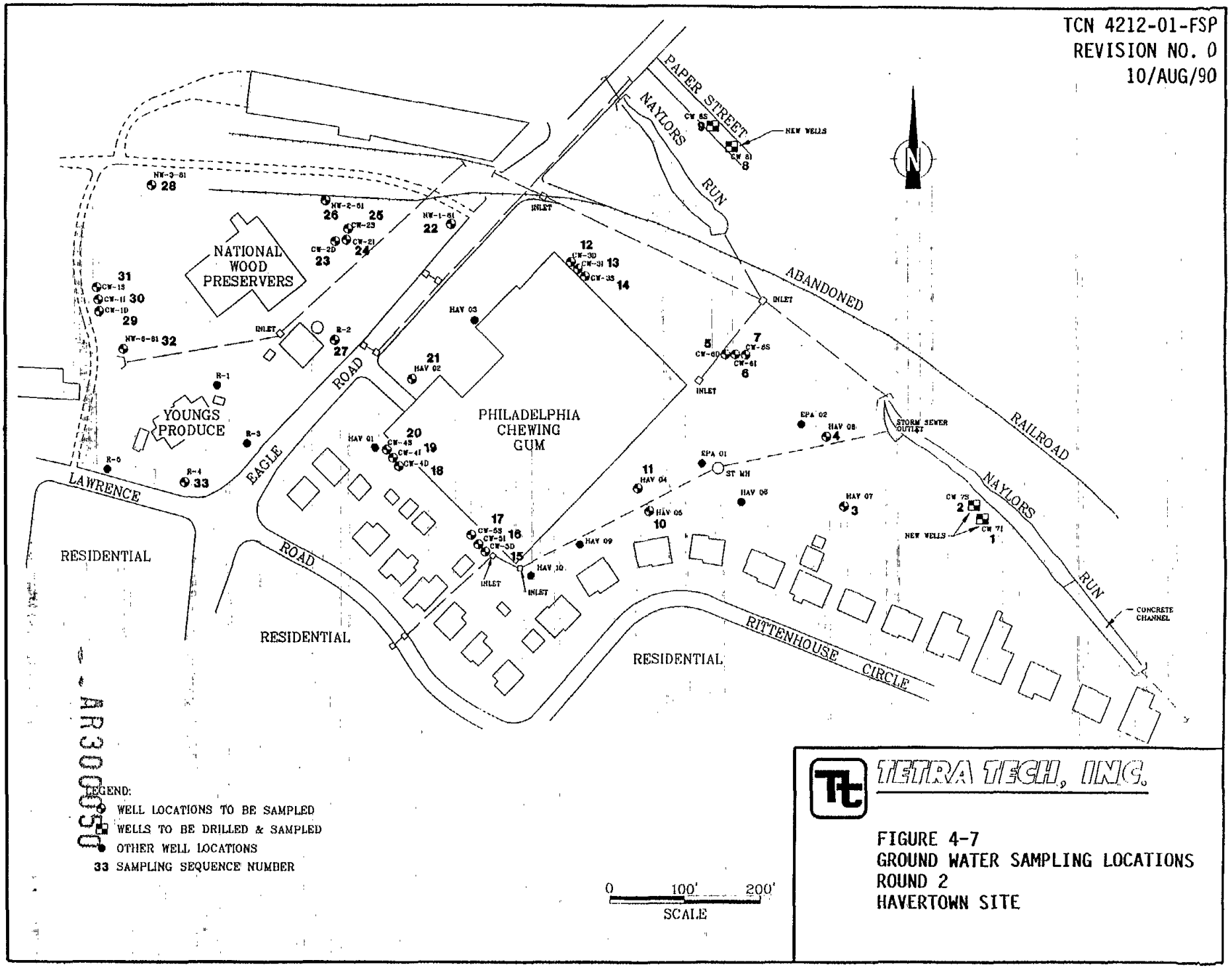

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FIGURE 4-7
GROUND WATER SAMPLING LOCATIONS
ROUND 2
HAVERTOWN SITE

Sample Handling and Analysis - The samples for this second round of sampling will be analyzed for full TCL/TAL compounds, as well as dioxin, dibenzofuran and their isomers. All the procedures described in Section 4.3, Monitoring Well Sampling - Round 1, are applicable for this Round 2 sampling and will be followed. Additional sampling requirements are the dioxin/dibenzofuran PE samples that will be supplied to Tetra Tech by the EPA RSCC. The two PE samples, one per week, will accompany the sampling containers to the site and then shipped to the laboratory for analysis.

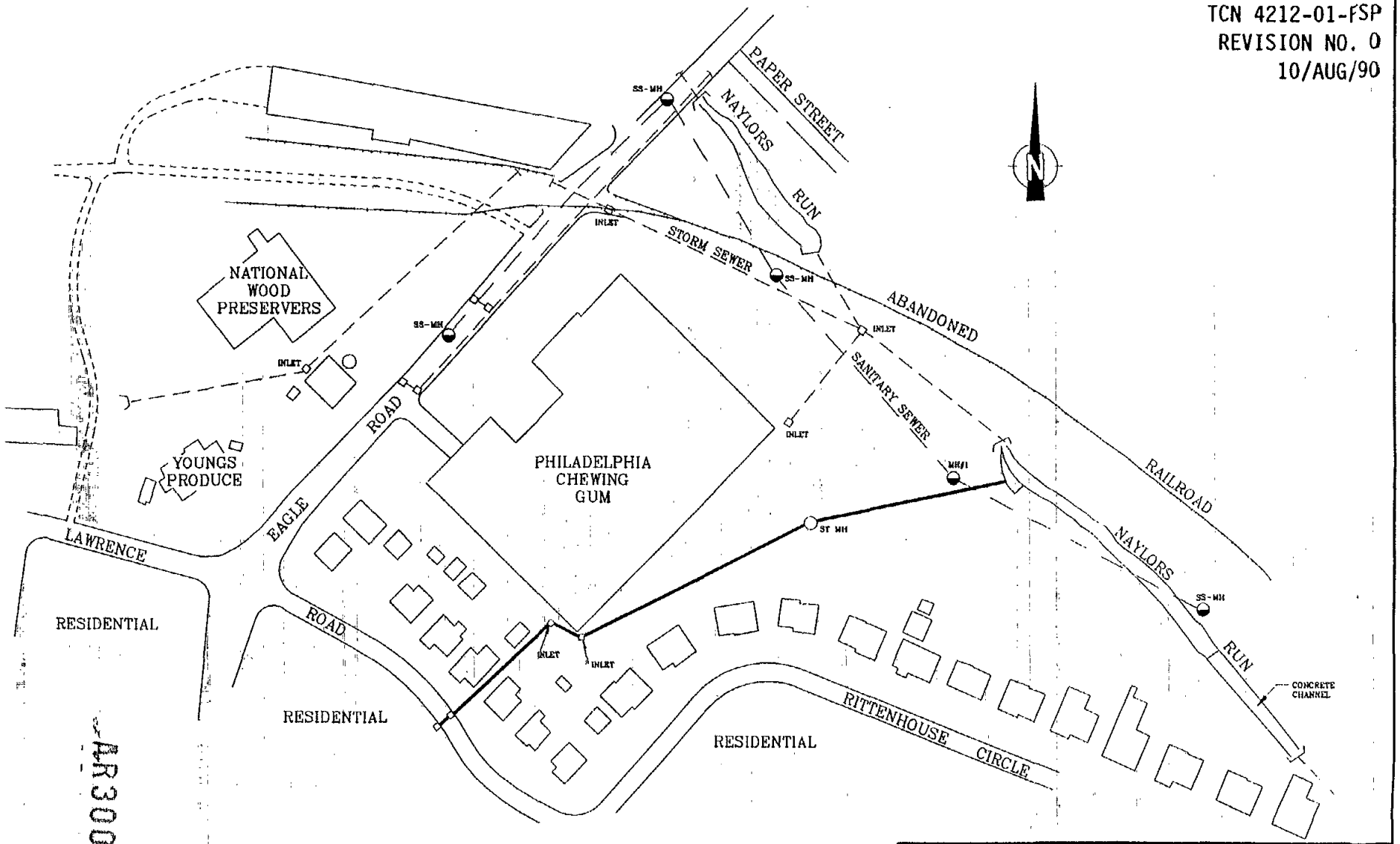
4.8 TV SURVEILLANCE OF STORM SEWER

Objective - The objective of inspecting the storm sewer is to determine its integrity. This task is relevant to the extent that the storm sewer may be acting as a conduit for contaminated ground water to enter Naylors Run.

Location and Frequency - The storm sewer line running from Lawrence Road to Naylors Run is to be inspected (Figure 4-8). Inspection will occur once.

Designation - This storm sewer line will be referred to as the Lawrence Road-Naylors Run Line.

Equipment and Procedures - The inspection of the Lawrence Road-Naylors Run Line will be performed by a subcontractor. The subcontractor will furnish all labor, electronic equipment and technicians to perform the closed circuit television inspection of the storm sewers. The equipment to be



LEGEND:

- STORM SEWER TO BE TV INSPECTED
- SANITARY SEWER
- STORM SEWER

0 100' 200'
SCALE

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FIGURE 4-8
TV SURVEILLANCE OF STORM SEWER
HAVERTOWN SITE

AR300052

provided by the subcontractor includes a camera, TV studio, and remote powered winches.

The television camera used for the inspection shall be one specifically designed and constructed for such inspection. Lighting for the camera shall be suitable to allow a clear picture for the entire periphery of the pipe. The camera shall be operative in 100 percent humidity conditions. The camera, television monitor and other components of the video system shall be capable of producing a minimum 500 line resolution video picture. Picture quality and definition shall be to the satisfaction of the Engineer and, if unsatisfactory, the equipment shall be replaced or repaired and no payment made for unsatisfactory inspection.

The TV studio is to be contained in an enclosed truck, trailer or van. It shall have room and seating for the operator and the Engineer and also room for at least one standing visitor with the doors closed. The studio shall have air conditioning and heating. Normal operation of all equipment, including the TV camera, monitor and winches, is to be from a control panel in the studio. When joint testing and sealing is also to be provided, this equipment shall be contained in the same unit as its TV equipment and shall be operated from the same control panel.

Remote powered and controlled winches are to be used to pull the television camera through the line. All equipment is to be such that the camera can be operated as specified at a distance of at least 1,000 feet from the TV studio.

Tetra Tech will oversee this work, ensuring the following procedures are followed:

1. Prior to inspection, any sediment that has accumulated in the storm sewer must be removed. A vacuum truck will be used to remove the sediment. The sediment will be transferred to 55 gallon drums for storage at the site.

2. The camera shall move through the line in either direction at a uniform rate, stopping when necessary to insure proper documentation of the sewer's condition, but in no case will the television camera be pulled at a speed greater than thirty feet per minute (30 fpm).

3. If, during the inspection operation, the television camera will not pass through the entire manhole section, the Contractor shall mobilize its equipment so that the inspection can be performed from the other manhole.

4. If the camera again fails to pass through the entire manhole section, the inspection will be considered complete and no additional inspection will be required unless a point repair is made by others and the Engineer directs that the line be re-televised.

5. Measurement for locations of defects and other points of interest, as directed by the Engineer, will be made by marking the TV cable and then stretching it out along the surface to the point to be marked. The distance will then be taped and recorded.

6. Points which do not need to be marked on the surface may be measured by an accurate footage meter. Points located in residential yards (private property) shall not be marked. Points to be marked shall include, but not be limited to, cracked or broken pipe, badly off-set joints, and laterals with constant running water or roots. The mark shall consist of a triple X (XXX), approximately four inches (4") by twelve inches (12"), made with a waterproof fluorescent green paint. Initials noting the problem, such as BP for broken pipe, will be painted next to the mark. Off-road points will be similarly marked using a surveyor's stake.

7. When laterals with constant running water are encountered, the camera will remain at the location while the Contractor checks to see if the source of the water can be determined.

8. Documentation of the television results shall be as follows: Printed location records shall be kept by the Contractor and will clearly show the location, of each infiltration point discovered by the television camera in relation to adjacent manholes. In addition, other points of significance such as locations of building storm sewers, joints, usual conditions, roots, storm sewer lateral connections, collapsed sections, presence of scale and corrosion and other discernible features will be recorded and a legible copy of such records will be supplied to the Engineer.

9. Instant developing photographs of the television monitor or problem areas shall be taken by the Contractor upon request by the Engineer. The following information, when applicable, shall be recorded on the back of the photograph:

   - From mh #, to mh #, date;
   - Street address and/or location description;
   - Pipe size and type, joint length;
   - Problem description;
   - Depth;
   - Distance from mh #; and
   - Location of nearby laterals.

10. The video tape recording shall supply a visual and audio record of problem areas of the lines that may be replayed both at the site that day and at future presentations. Video tape recording playback shall be at the same speed that it was recorded. A stop motion playback feature shall be supplied in the field. The Contractor shall be required to turn the tapes over to the Engineer at the end of the taping session. The tape will be of the standard one half inch (½") VHS cassette type format and will be recorded so as to be compatible with standard VHS playback equipment.

4.9 ENVIRONMENTAL BASELINE ASSESSMENT

Objective - To determine the presence, if any, of benthic organisms within Naylors Run and terrestrial receptors adjacent to Naylors Run.

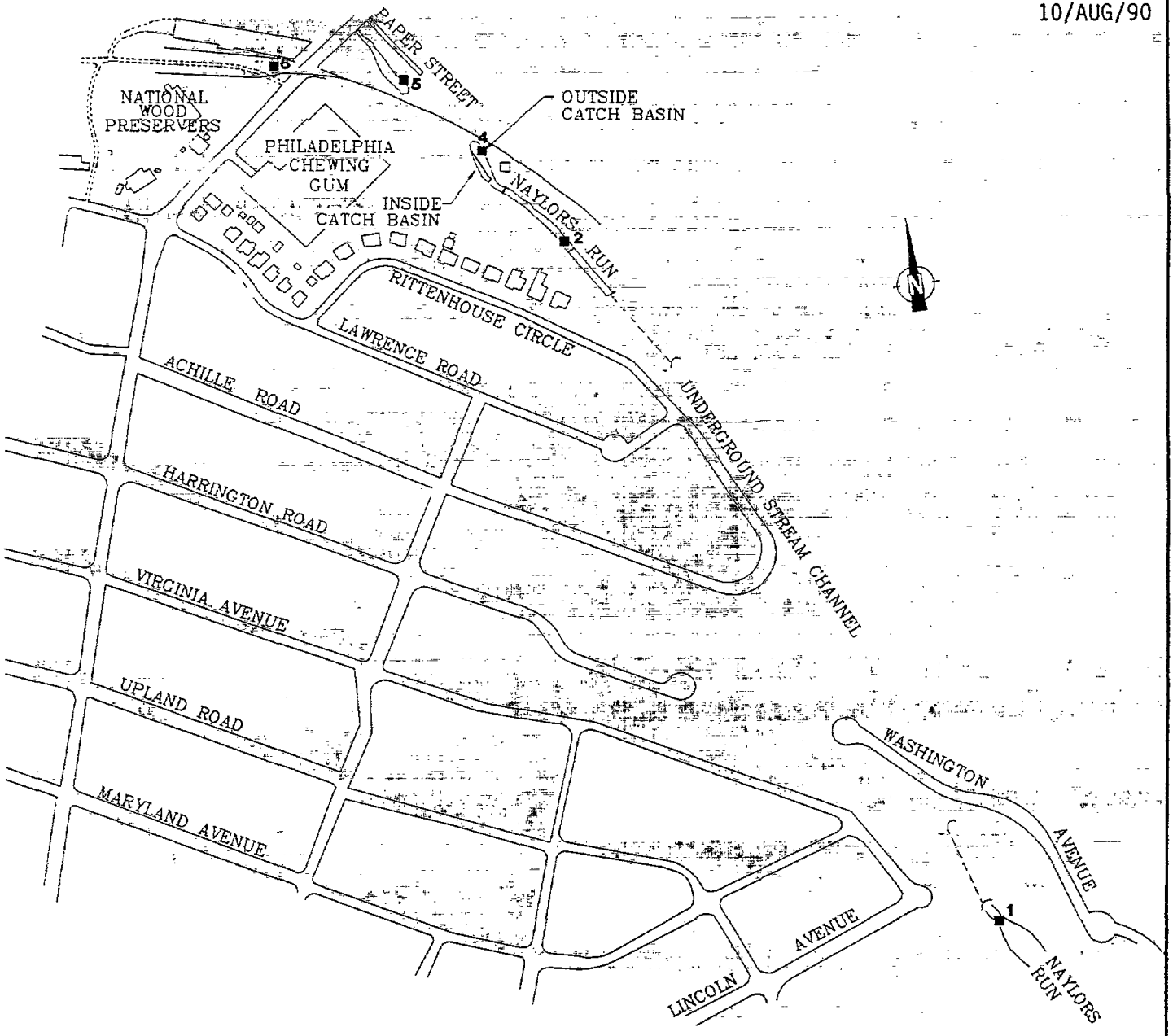
Sampling Location and Frequency - Five stations will be set up along Naylors Run. These stations will be located at sample points 1, 2, 4, 5, and 6 (Figure 4-9), where sediment and surface water samples will be collected. This environmental assessment will be made only once.

Sampling Designation - Stations will be designated HV-EA-01, HV-EA-02, HV-EA-04, HV-EA-05, and HV-EA-06. The letters HV identify the site; the letters EA identify this portion of the investigation as the Environmental Assessment, and the numerals 01 through 06 identify the location. No Environmental Assessment will be conducted inside the catch basin (Station 3).

Sample Equipment and Procedures

A. Benthos Sampling in Shallow Streams

Benthic analysis will be conducted by a two-person Tetra Tech sampling team. This procedure is applicable to collection of macroinvertebrates from shallow streams for determination of the biological health of disturbed stream communities, according to Rapid Bioassessment Protocol II developed by the USEPA. Two separate procedures are followed at each sampling location; riffle/run and coarse particulate organic matter



NOTE: NOT TO SCALE

LEGEND:

- ■ ENVIRONMENTAL ASSESSMENT LOCATIONS
- 6 ASSESSMENT SEQUENCE NUMBER

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FIGURE 3-9
ENVIRONMENTAL ASSESSMENT LOCATIONS
HAVERTOWN SITE

(CPOM) sample procedures. Two samples are obtained in the riffle/run procedure at each station, and combined as described below. One CPOM sample is collected separately at each station.

Riffle/Run Sampling Procedure

1. Lower kick net into riffle to be sampled.

2. Collect sample from a fast-flowing 1 m^2 area.

3. Rinse to remove fine sediments.

4. Rinse, visually inspect, and discard all large organic materials.

5. Place sample contents into a 30 x 45 cm flat, white-bottom pan, previously marked with a numbered grid pattern, each grid block measuring 5 x 5 cm.

6. Repeat steps 2-5 for a slow-moving area from the same sampling station, resulting in a composite sample present in the pan.

7. Add club soda to the pan (to anesthetize and slow down the organisms), just enough to completely disperse the sample.

8. Distribute sample material evenly within the pan by gentle shaking.

9. Using a random number table, select a number corresponding to a square within the gridded pan, and remove all organisms from within the square and place in a second pan for identification.

10. Repeat step 9 until the total number of organisms removed is within 10 percent of 100.

11. For organisms that lie across a line separating two squares, the organism is considered to be in the square containing either its head, if evident, or the largest part of the body, if no head is evident.

12. Identify all organisms in the identification pan to the family level, list the number of organisms in each family, and record these as observations on abundance of other aquatic biota, on the Biosurvey Field Data Sheet labeled for that sampling location.

13. Classify all organisms to Functional Feeding Group based on known morphological and behavioral features, and record group abundances on the Biosurvey Field Data Sheet.

14. Preserve all organisms from the grid pan in a jar containing 10 percent formalin, labeled with all necessary information, for archiving and potential quality control reanalysis.

15. Record information in field logbook and complete all appropriate chain-of-custody documents and seals.

CPOM Sampling Procedure

1. Collect 5 handfuls of coarse particulate organic matter from the sampling station, making sure to collect only the upper surface of litter accumulating from the stream bed and avoiding recently deposited or fully decomposed leaf litter.

2. Rinse composited material in a sieve bucket.

3. List the number of total organisms, and the number of individuals representing the Shredder Functional Group, on the Biosurvey Field Data Sheet (a subsample of 40 organisms may be classified if more than this number are collected in the sample).

4. Return organisms and CPOM to the stream.

5. Record information in the field logbook and complete any appropriate chain-of-custody documents.

B. Ecological Sampling of Terrestrial Habitats

Collection of data for use in assessment of the health of biological communities will be conducted by a two-person Tetra Tech sampling team. These procedures are applicable to sampling of vegetation at predetermined sampling stations. A total of 5 sampling stations will be located in each habitat. Generalized sampling procedures, listed below, are applicable to all habitat types; portions of the procedures

may be modified or excluded if not appropriate based on the characteristics of the vegetation at a sampling location. In general, the following steps will be conducted at each sampling location to amass the data necessary to evaluate species abundance, composition, standing crop, productivity, and nutrient retention.

1. Using the sampling point as a center, measure 5 nested circular quadrants with a 20m tape measure, and mark the radius of each circle with a colored stake. The circles will have radii of 0.18, 0.80, 1.13, 1.78,and 5.64 meters.

2. Record the presence of each plant species found in the nested quadrants, including any part of the individual that is within the quadrant, with the following guidelines:

   a. Mosses are counted only in the smallest circle, and are recorded only "present" or "not present."

   b. All herbs found within the 0.80 meter radius circle are recorded by species and abundance.

   c. All low shrubs (height to be determined upon inspection in the field) found within the 1.13 m radius circle are recorded by species and abundance.

d. All shrubs taller than the height determined in "c" above, and trees lower than 1.8 m tall, found within the 1.78 m radius circle are recorded by species and abundance.

e. All trees greater than 1.8 m tall found within the 5.64 m radius circle are recorded by species and abundance.

3. Lay a 20 m tape measure along the ground, beginning at the center of the quadrant and extending in a direction determined from a table of random numbers.

4. Measure the distance (cm) intercepted by each plant, as well as by litter and bare ground, with the constraints:

   a. Grasses and forbs are measured on the line at ground surface.

   b. Shrubs and trees are measured on the crown spread intercept using a cover-sight, including the entire crown even if only a portion intercepts the tape. Breaks in the crown of less than 10 cm can be considered as solid crown; breaks larger than this must be subtracted from the total crown spread.

5. Clip all forb within the 0.80 m radius circle at ground level, separate individuals by species, and place in properly labeled, sealable plastic bags. Record fresh weight of each species on a balance.

6. For each shrub found within the 1.78 m radius circle, measure and record the following parameters:

   a. Main stem diameter at ground height (use calipers).

   b. Number of live twigs per plant.

   c. Length of each live twig (use tape measure).

   d. Diameter of stem of each live twig (use calipers).

7. Collect all dead plant material found within the 1.78 m radius circle and place in a properly labeled, sealable plastic bag. Record weight on a balance.

8. For each tree included in the 20 m transect (step 4 above), record the following:

   a. Bark thickness at breast height (use a knife to cut off a small piece of bark).

   b. Diameter of main trunk at breast height (use calipers).

   c. Diameter of all branches within 2 m of the ground, at 60 cm from the trunk (use calipers).

9. Walk in a random direction from the original sample location, as determined by the table of random numbers, a distance of 50-200 meters, again consulting a table of random numbers. Repeat until a total of four additional sample locations have been delineated.

10. Repeat steps 1-8 for each of the other four locations.

11. All data sheets and samples shall be uniquely labeled and proper chain-of-custody rules will be observed.

12. Within 24 hours of data collection, oven dry clipped forb and litter samples at 75°C and weigh dry samples on a balance.

Sample Handling and Analysis - Not Applicable

5.0 DECONTAMINATION PROCEDURES

All equipment decontamination shall follow the Tetra Tech Standard Operation Procedure, General Equipment Decontamination, specified below.

5.1 GENERAL EQUIPMENT DECONTAMINATION

All field equipment that becomes potentially contaminated during a sample collection task will be decontaminated using the method described below. The equipment may include split spoons, bailers, trowels, shovels, hand augers, or any other equipment used during field activities.

Decontamination is performed as a quality assurance measure and a safety precaution. It prevents cross-contamination between samples and helps maintain a clean working environment.

Decontamination is achieved mainly by rinsing with liquids that include: soap and/or detergent solutions, tap water, distilled water, and methanol. Equipment may be allowed to air dry after being cleaned.

At the project site, decontamination will be accomplished between each sample collection point. Waste products produced by the decontamination procedures such as waste liquids, solids, rags, gloves, etc. will be collected and disposed of properly based on the nature of contamination.

It is the responsibility of the field sampling coordinator to assure that proper decontamination procedures are followed and that all waste materials produced by decontamination are properly managed. It is the responsibility of the project site health and safety officer to draft and enforce safety measures that provide the best protection for all persons involved directly with sampling or decontamination.

It is the responsibility of any subcontractor (e.g., drilling contractors) to follow the proper, designated decontamination procedures specified in the contract and outlined in the project HSP. It is the responsibility of all personnel involved with sample collection or decontamination to maintain a clean working environment and to ensure that any contaminants are not negligently introduced to the environment.

Supporting materials to be available at the site include:

- Cleaning liquids and dispensers: soap and/or detergent solutions, tap water, distilled water, methanol;
- Personal safety gear as defined in the project Health and Safety Plan;
- Chemical-free paper towels;
- Disposal gloves;
- Waste storage containers: drums, boxes, plastic bags;
- Cleaning containers: plastic and/or galvanized steel pans and buckets;
- Cleaning brushes; and
- Aluminum foil.

The extent of known contamination will determine the degree of decontamination required. If the extent of contamination cannot be readily determined, cleaning should be performed according to the assumption that the equipment is highly contaminated.

To the extent practical, initial decontamination of equipment shall be well away from proposed working or sampling locations to minimize surface contamination potential. Decontamination areas shall be established, as specified in the HSP, all decontamination procedures shall be performed in

a shallow plastic-lined collection pit, and all waste generated shall be placed in lined 55-gallon drums. Decontamination procedures to be implemented are as follows:

- Disassembly of the equipment, if required;
- Remove gross contamination from the equipment by brushing and then rinsing with tap water;
- Wash with soap or detergent solution (Alconox solution preferred);
- Rinse with tap water;
- Rinse with methanol (20% V/V dilution) [optional];
- Rinsed with distilled water;
- Repeat entire procedure or any parts of the procedure as necessary; and
- Air drying of the equipment in a clean area.

The field personnel will use a new pair of outer gloves before handling sampling equipment after it has been cleaned.

5.2 PERSONNEL DECONTAMINATION

Personal decontamination will be performed as specified in the HSP.

5.3 DECONTAMINATION MATERIALS HANDLING

Once all decontamination has been completed, the decontamination area shall be disassembled. All visqueen and disposable protective clothing will be containerized and the drums will be sealed and labeled to include date, contents, and site name.

Decontamination fluid residuals will be pumped out of the decontamination pad daily on an as-need basis and containerized in a bung type 55-gallon drum. The drum will be labeled to include date, contents, and site name.

Drums containing waste liquids and solids will be left at the site for later proper disposal. The number of solid and liquid 55-gallon drums will be counted and recorded in the field logbook. A separate inventory of full and empty drums shall be maintained.

6.0 FIELD DOCUMENTATION

Documentation of all field activities shall be in accordance with the Tetra Tech Standard Operating Procedure, Field Logbook/Photographs, specified below:

6.1 FIELD LOGBOOK

All pertinent field survey and sampling effort information shall be recorded in a logbook during each day of the field effort. A logbook will be assigned to each field task and will have a unique document control number.

The logbook will be bound and will have consecutively numbered pages. The field task leader shall be responsible for ensuring that sufficient detail is recorded, and shall review the site logbooks daily and initial each page reviewed. No general rules can specify the extent of information that must be entered in a logbook. However, logbooks shall contain sufficient information so that someone can reconstruct the field activity without relying on the memory of the field crew. All entries shall be made in indelible ink. Each day's entries will be initialed and dated at the end by the author, and a line will be drawn through the remainder of the page. All corrections shall consist of line-out deletions that are initialed.

At a minimum, entries in a logbook shall include:

- Date and time of starting work;
- Names of field task leader and team members;
- Purpose of proposed work effort;
- Description of work area, including information on photographs taken;
- Location of work area, including map reference;
- Details of work effort, particularly any deviation from the field; operations plan or standard operating procedures;
- Field observations;
- Field measurements (e.g., pH);
- Field laboratory analytical results;
- Personnel and equipment decontamination procedures; and
- Daily health and safety entries, including levels of protection.

For sampling efforts, specific details for each sample shall be recorded on separate sample data sheets. However, in addition to the items listed above, the following general information shall be included in the logbook during sampling efforts:

- Type and number of samples;
- Sampling method, particularly deviations from the standard operating procedures;
- Sample location and number; and
- Sample handling, packaging, labeling, and shipping information (including destination).

Strict custody procedures shall be maintained with the field logbooks. While being used in the field, logbooks shall remain with the field team at all times. Upon completion of the field effort, the logbook shall be locked in a filing cabinet in the field office. Photocopies of the logbooks will be used as working documents.

6.2 PHOTOGRAPHS

Photographs provide the most accurate demonstration of the field worker's observations. They can be significant to the field team during future inspections, informal meetings, and hearings. Photographs should be taken with a camera-lens system having a perspective similar to that afforded by the naked eye. Telephoto or wide-angle shots cannot be used in enforcement proceedings. A photograph must be documented if it is to be a valid

representation of an existing situation. Therefore, for each photograph taken, several items shall be recorded in the field logbooks:

- Date and time;
- Name of photographer;
- Name of site and field task;
- General direction faced and description of the subject;
- Location on-site; and
- Sequential number of the photograph and roll number.

Once a roll of film is developed, the slides or prints will be placed in task files in the field office. Photographic information from the logbooks will be photocopied and placed in the file accompanying the slides or prints.

7.0 QA/QC SAMPLE COLLECTION

Quality Assurance/Quality Control (QA/QC) sampling for the HAVERTOWN site shall be conducted as detailed below. Table 7-1, Sample Summary, identifies the QA/QC Samples required for HAVERTOWN.

7.1 DUPLICATE COLLECTION

Generally, duplicate samples will be collected for every fifteen (15) routine samples collected per matrix, per analysis. The actual number of duplicate samples per matrix, per analysis will be per Table 7-1, Sampling

TABLE 7-1
HAVERTOWN SITE
SAMPLING SUMMARY

MATRIX	ANALYSIS	DATA USE (c)	DATA QUALITY OBJECTIVE LEVEL (d)	TARGET DETECTION LIMIT (e)	PROPOSED ANALYTICAL METHOD	SOURCE OF ANALYSIS	NUMBER OF SAMPLES	NO. OF FIELD DUPLICATES	NO. OF MS & MSD PAIRS (f)	NO. OF FIELD BLANKS (g)	NO. EQUIP. RINSEATE BLANKS (h)	NUMBER OF PE SAMPLES (i)	NO. OF TRIP BLANKS (j)
GROUNDWATER	TCL ORGANICS	1	IV	CRDL	CLP PROTOCOL	CLP SAS	29	2	2	2	2	-	8
	TAL INORGANICS	1	IV	CRDL	CLP PROTOCOL	CLP SAS	29	2	2	2	2	-	-
	TCL ORGANICS	1,2,3,4	IV	CRDL	CLP PROTOCOL	CLP RAS	33	2	2	2	2	-	9
	TAL INORGANICS	1,2,3,4	IV	CRDL	CLP PROTOCOL	CLP RAS	33	2	2	2	2	-	-
	DIOXIN/DIBENZOFURAN	1,2,3,4	IV	CRDL	CLP PROTOCOL	CLP SAS	33	2	2	2	2	2	-
SURFACE WATER (a)	TCL ORGANICS	1,2,3,4	IV	CRDL	CLP PROTOCOL	CLP RAS	6	1	1	1	1	-	1
	TAL INORGANICS	1,2,3,4	IV	CRDL	CLP PROTOCOL	CLP RAS	6	1	1	1	1	-	-
	DIOXIN/DIBENZOFURAN	1,2,3,4	IV	CRDL	CLP PROTOCOL	CLP SAS	6	1	1	1	1	1	-
SURFACE WATER (b)	TCL ORGANICS	1,2,3,4	IV	CRDL	CLP PROTOCOL	CLP RAS	4	1	1	1	1	-	1
	TAL INORGANICS	1,2,3,4	IV	CRDL	CLP PROTOCOL	CLP RAS	4	1	1	1	1	-	-
	DIOXIN/DIBENZOFURAN	1,2,3,4	IV	CRDL	CLP PROTOCOL	CLP SAS	4	1	1	1	1	1	-
SEDIMENT (a)	TCL ORGANICS	1,2,3,4	IV	CRDL	CLP PROTOCOL	CLP RAS	6	1	1	1	1	-	1
	TAL INORGANICS	1,2,3,4	IV	CRDL	CLP PROTOCOL	CLP RAS	6	1	1	1	1	-	-
	DIOXIN/DIBENZOFURAN	1,2,3,4	IV	CRDL	CLP PROTOCOL	CLP RAS	6	1	1	1	1	1	-
	GRAIN SIZE	1,2,3,4	V	-	ASTM D422-63 D421-85	CLP SAS	5	1	-	-	-	-	-
SEDIMENT (b)	TCL ORGANICS	1,2,3,4	IV	CRDL	CLP PROTOCOL	CLP RAS	4	1	1	1	1	-	1
	TAL INORGANICS	1,2,3,4	IV	CRDL	CLP PROTOCOL	CLP RAS	4	1	1	1	1	-	1
AIR	ORGANIC VAPORS	1	I				*	-	-	-	-	-	-

(a) Naylors Run
Sediment and Seep
(b) Storm Sewer
(c) 1 - Site Characterization
2 - Risk Assessment
3 - Evaluation of Alternatives
4 - Engineering Design of Alternativ

* Continuous Monitoring

(d) I - Vapor detection using portable field instruments
IV - TCL Organics/Inorganics Low detection levels
V - Non-Conventional Parameters
(e) Contract Required Detection Limit (See Appendix D of QAPjP)
(f) Matrix Spikes (MS) and Matrix Spike Duplicates (MSD)

(g) Number based on one QC sample per 20 matrix samples

(h) Number based on one QC sample per 20 matrix samples

(i) Performance Evaluation (PE) Sample (Required Dioxin QC protocol)

(j) Number based on estimated number of days of sampling and taking 1 trip blank per day

Summary. The duplicates will be collected in the same manner as their corresponding routine samples.

7.2 MATRIX SPIKE AND MATRIX SPIKE DUPLICATE COLLECTION

Matrix spikes and matrix spike duplicates are laboratory required quality control samples. However, the laboratory must be provided with additional sample volume for each sample matrix to complete their analysis. One matrix spike/matrix spike duplicate (MS/MSD) pair will be collected per Table 7-1, Sampling Summary. Again, the MS/MSD pairs will be collected in the same manner as their corresponding routine samples.

7.3 FIELD BLANK COLLECTION

Field blanks are blanks prepared prior to the sampling event from clean, analyte-free materials most closely resembling the sample matrices to be collected in the field. The blanks are transported to the field along with the containers in which the routine samples will be collected. Once in the field, the caps of the field blanks are removed so that the field blanks are exposed to the same conditions as the routine samples. At the end of each location sampling event, the caps to the field blanks are replaced, and the blanks are then subjected to the same protocol as the routine samples. Field blanks per matrix, per analysis requested will be collected per Table 7-1, Sampling Summary.

7.4 EQUIPMENT RINSEATE BLANK COLLECTION

Equipment rinseate blank per analysis requested will be collected per Table 7-1, Sampling Summary. The equipment rinseate blank will be collected by pouring analyte-free water, supplied by the laboratory, directly over decontaminated sampling equipment into a prepared sample container. The equipment rinseate blanks are then shipped to the laboratory with the other routine samples collected.

7.5 TRIP BLANK COLLECTION

Trip blanks for volatile organic samples are prepared in the laboratory prior to the sampling event using analyte-free water. The trip blanks accompany the routine sample containers to the field, during collection of the samples in the field, and during transport of the routine volatile organic samples back to the laboratory. One trip blank sample will be used for each day of sampling for volatile organic compounds.

A summary of QA/QC sampling at the HAVERTOWN site is shown in Table 7-1.

8.0 SAMPLE HANDLING PROCEDURES

8.1 CLP PROTOCOL

Under the Contract Laboratory Program (CLP), a number of elements are necessary to ensure proper handling of the samples once they are collected in the field. These element consist of: proper labeling of the samples,

maintaining and documenting sample custody, documenting sample transfer, proper packaging and shipping of samples, and notifying the proper agents that the samples have been shipped.

Prior to the sampling event, certain forms and information will be made available by either the Sample Management Office (SMO) of the CLP or EPA's Central Regional Laboratory (CRL). The forms required include Chain-of-Custody Record (Figure 8-1), Organic and Inorganic Traffic Reports (Figures 8-2 and 8-3), Special Analytical Services (SAS) Packing List (Figure 8-4), CLP Dioxin Shipping Record (Figure 8-5), Dioxin PE Tracking Form (Figure 8-6), and EPA Shipping Logs (Figure 8-7). Also required are CLP Sample Numbers, Chain-of-Custody Seals, and Sample Tags (Figure 8-8).

The required information that will be provided includes the Case Number, the type of activity (e.g., RA, RD, RI/FS, etc.), the Site Spill ID, the sample bottle lot numbers, and the name of the CLP Laboratory where the samples will be shipped.

Upon collecting any given sample, the sample label must first be filed in. The information required on the label includes a unique sample number, the sample location, the sampling date and time, the name of the sampler, the analysis requested, and the preservative, if any. This information should also be recorded in the field book.

After completing the sample label, one of the "unique" CLP Sample Number Labels should be placed on the sample bottle. Figure 8-8 shows an example of each of the three separate "unique" Sample Number Labels that the CLP

requires for organic, inorganics, and dioxin. The analysis indicated on the CLP Sample Number Label should match the analysis requested on the sample bottle label. The preprinted labels beginning with the letter "C" represents label and sample numbers to be used for all TCL sample bottles. For TAL sample bottles the preprinted "M" labels will be used and the "D" labels will be used for the dioxin sample bottle.

After the CLP Sample Number has been placed on the sample bottle, the Sample Tags should be completed and affixed to the sample bottles. To complete the Sample Tags (Figure 8-9), the following information is required:

- The sampling station number and the sampling station location;
- The date and time;
- Whether the sample is composite or grab;
- Whether the sample has been preserved or not;
- The type of analysis requested;
- Under "Remarks";
  - The case number;
  - The CLP sample number; and
  - The bottle lot number.

Under the type of analysis requested on the sample tag, TCL volatile organics is equivalent to volatile organics, TCL BNA is equivalent to organics GC/MS, TCL pesticides/PCB's is equivalent to pesticides, and TAL inorganics is equivalent to metals.

8.2 SAMPLE CUSTODY

In order to verify sample integrity, written conclusive proof is required that samples are taken, transferred, prepared and analyzed in an unbroken chain. That written proof is a chain-of-custody record. By definition, samples are in custody if they:

- Are in the possession of an authorized individual;
- Are in the field of vision of an authorized individual; and
- Are in a secure area or a locked container.

The field and laboratory sample custodians are responsible for sample custody during all sample handling activities.

A completed example of a Chain-of-Custody Record is shown in Figure 8-1.

To complete the form, the following information must be provided:

- The project number which is equivalent to the case number;
- An abbreviation for the project name; the contract lab is not to be given the full site name;
- The samplers signature;
- The station number which may be equivalent to the station location;
- The date and time the sample was taken;
- Whether the sample is composite or grab;
- The number of containers in which the sample has been placed;
- The type of analyses requested;

ENVIRONMENTAL PROTECTION AGENCY
Office of Enforcement

REGION 3
Curtis Bldg., 6th & Walnut Sts.
Philadelphia, Pennsylvania 19106

CHAIN OF CUSTODY RECORD

PROJ NO: 1736 | PROJECT NAME: McA

SAMPLERS (Signature): Christopher Bruno

STA NO	DATE	TIME	COMP	GRAB	STATION LOCATION	NO OF CONTAINERS	BNA	VOA					REMARKS QTR #	REMARKS TAG #
E10-1-1	3/20/89	1645		X	E10-1-1	1	X						CANS9	3-105005
"	↓	"		X	E10-1-1	3		X					CANS9	3-105012
C6-1-1		1700		X	C6-1-1	1	X						CANG0	3-105003
"		"		X	C6-1-1	3		X					CANG0	3-105004
B4-1-1		1720		X	B4-1-1	1	X						CANG1	3-105013
"		"		X	B4-1-1	3		X					CANG1	3-105014
B5-1-1		1800		X	B5-1-1	1	X						CANG2	3-105040
"	↓	"		X	B5-1-1	3		X					CANG2	3-105041

AR300078

Relinquished by (Signature)	Date / Time	Received by: (Signature)	Relinquished by (Signature)	Date / Time	Received by: (Signature)
Christopher Bruno	3/21/89 1300				
Relinquished by (Signature)	Date / Time	Received by: (Signature)	Relinquished by (Signature)	Date / Time	Received by (Signature)
Relinquished by (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Remarks	
				FEDEX AIRBILL # 945064206	

Distribution: Original Accompanies Shipment, Copy to Coordinator Field Files

CHAIN-OF-CUSTODY RECORD
HAVERTOWN PCP SITE

FIGURE 8-1

TCN 4212-01-FSP
REVISION NO. 0
10/AUG/90

- Under "Remarks" (in the upper right corner of the record), the CLP sample number that was previously placed on the sample;
- Under "Remarks" (in the lower right corner of the record), the airbill number of the container in which the samples will be shipped to the laboratory. (When samples are shipped to the laboratory via commercial carrier, the airbill serves as an extension of the chain-of-custody.); and
- Under "Relinquished by" and "Received by", the signature of every authorized person who maintains custody of the samples.

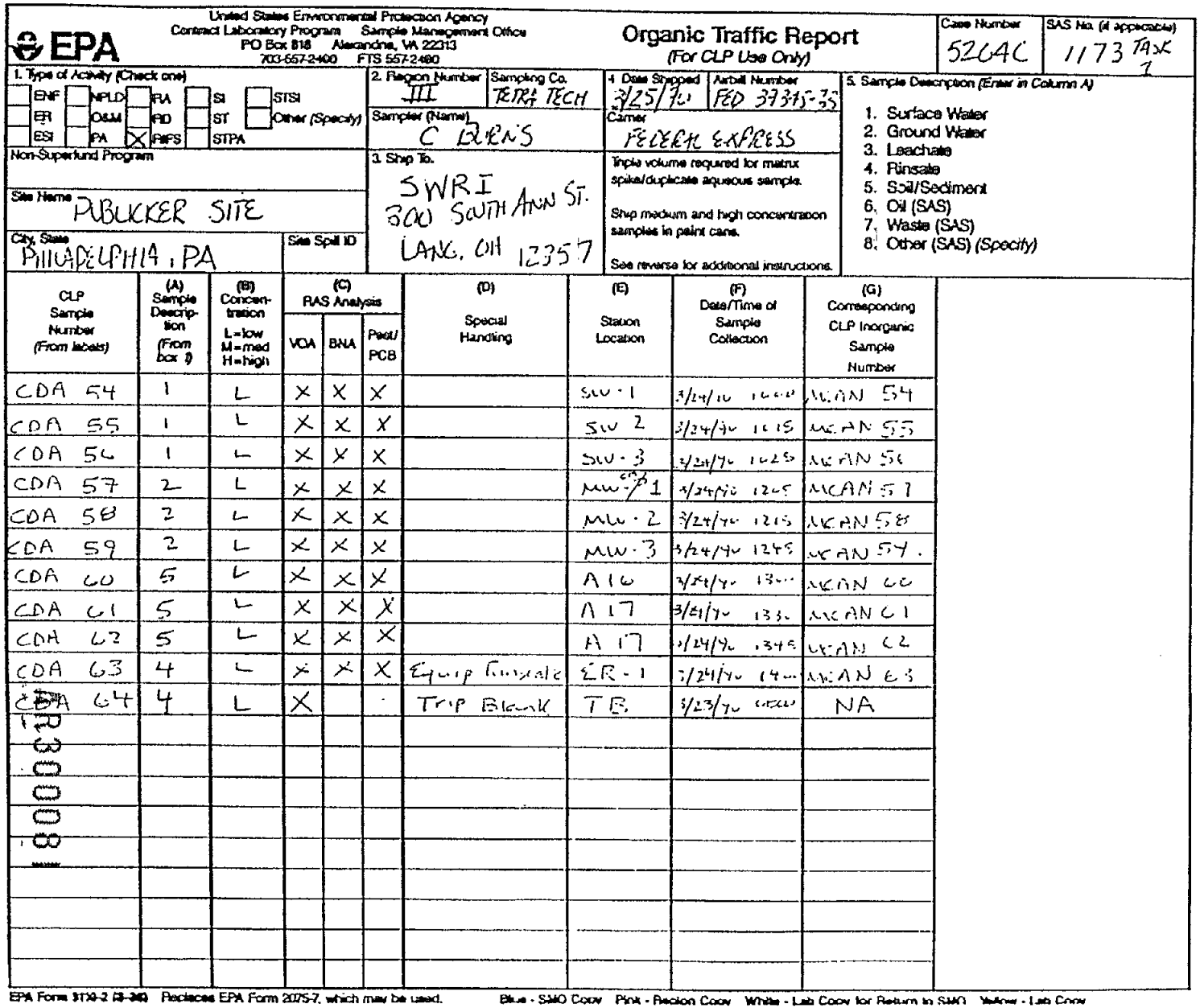
8.3 TRAFFIC REPORTS

Included with samples to be shipped for analysis of organics or inorganics to a CLP laboratory contracted under the Routine Analytical Services (RAS) program will be an Organic Traffic Report or an Inorganic Traffic Report. A completed example of an Organic Traffic Report and Inorganic Traffic Report are shown in Figures 8-2 and 8-3. The following information must be provided to complete the top portion of each Traffic Report:

The case number and SAS number (if applicable)

(1) The type of activity (PA, SI, ESI, RI/FS, etc.)
- The site name;
- The city and state of the site; and
- The Site Spill ID.

(2) The EPA region number where the sampling is being performed; and the name of the sampling company and sampler.



EPA

United States Environmental Protection Agency
Contract Laboratory Program Sample Management Office
PO Box 818 Alexandria, VA 22313
703-557-2400 FTS 557-2400

Organic Traffic Report
(For CLP Use Only)

Case Number: 5264C
SAS No. (if applicable): 1173 TAX 1

1. Type of Activity (Check one): ENF, ER, ESI, NPLD, O&M, PA, RA, RD, RIFS, SI, ST, STPA, STSI, Other (Specify)

2. Region Number: III
Sampling Co.: TETRA TECH
Sampler (Name): C LOVENS

4. Date Shipped: 3/25/90
Airbill Number: FED 37375-35
Carrier: FEDERAL EXPRESS

Non-Superfund Program

Site Name: PUBLICKER SITE
City, State: PHILADELPHIA, PA
Site Spill ID:

3. Ship To:
SWRI
300 SOUTH ANN ST.
LANC. OH 12357

Triple volume required for matrix spike/duplicate aqueous sample.

Ship medium and high concentration samples in paint cans.

See reverse for additional instructions.

5. Sample Description (Enter in Column A)
1. Surface Water
2. Ground Water
3. Leachate
4. Rinsate
5. Soil/Sediment
6. Oil (SAS)
7. Waste (SAS)
8. Other (SAS) (Specify)

CLP Sample Number (From labels)	(A) Sample Description (From box 1)	(B) Concentration L=low M=med H=high	(C) RAS Analysis: VOA	BNA	Pest/PCB	(D) Special Handling	(E) Station Location	(F) Date/Time of Sample Collection	(G) Corresponding CLP Inorganic Sample Number
CDA 54	1	L	X	X	X		SW-1	3/24/90 1000	MCAN 54
CDA 55	1	L	X	X	X		SW 2	3/24/90 1015	MCAN 55
CDA 56	1	L	X	X	X		SW-3	3/24/90 1025	MCAN 56
CDA 57	2	L	X	X	X		MW-3/1	3/24/90 1205	MCAN 57
CDA 58	2	L	X	X	X		MW-2	3/24/90 1215	MCAN 58
CDA 59	2	L	X	X	X		MW-3	3/24/90 1245	MCAN 59
CDA 60	5	L	X	X	X		A16	3/24/90 1300	MCAN 60
CDA 61	5	L	X	X	X		A17	3/24/90 1330	MCAN 61
CDA 62	5	L	X	X	X		A17	3/24/90 1345	MCAN 62
CDA 63	4	L	X	X	X	Equip Rinsate	ER-1	3/24/90 1400	MCAN 63
CDA 64	4	L	X			Trip Blank	TB	3/23/90 0000	NA

EPA Form 9130-2 (8-89) Replaces EPA Form 2075-7, which may be used. Blue - SMO Copy Pink - Region Copy White - Lab Copy for Return to SMO Yellow - Lab Copy

ORGANIC TRAFFIC REPORT
HAVERTOWN PCP SITE

FIGURE 8-2

TCN 4212-01-FSP
REVISION NO. 0
10/AUG/90

United States Environmental Protection Agency
Contract Laboratory Program Sample Management Office
PO Box 818 Alexandria, VA 22313
703-557-2490 FTS 557-2490

Inorganic Traffic Report
(For CLP Use Only)

Case Number: 5204 3 | SAS No. (If applicable): 1173 TASK 3

1. Type of Activity (Check one): ENF, NPLD, RA, SI, STSI; ER, O&M, RD, ST, Other (Specify); ESI, PA, X RIFS, STPA

2. Region Number: III | Sampling Co.: TETRA TECH

Sampler (Name): C. BURNS

4. Date Shipped: 3/25/90 | Airbill Number: FED 53345

Carrier: FEDERAL EXPRESS

Non-Superfund Program

Site Name: PUBLICKER SITE

City, State: PHILADELPHIA, PA | Site Spill ID

3. Ship To: ABC LAB, 21 SOUTH BOB ST., ORANGE, FL 12737

Double volume required for matrix spike/duplicate aqueous sample.

Ship medium and high concentration samples in paint cans.

See reverse for additional instructions.

5. Sample Description (Enter in Column A)
1. Surface Water
2. Ground Water
3. Leachate
4. Rinsate
5. Soil/Sediment
6. Oil (SAS)
7. Waste (SAS)
8. Other (SAS) (Specify)

CLP Sample Number (From labels)	(A) Sample Description (From box 1)	(B) Concentration L=low M=med H=high	(C) RAS Analysis: Total Metals	(C) RAS Analysis: Cyanide	(D) Special Handling	(E) Station Location	(F) Date/Time of Sample Collection	(G) Corresponding Organic Sample Number
MCAN 54	1	L	X	X		SW-1	3/24/90 1000	CDA 54
MCAN 55	1	L	X	X		SW-2	3/24/90 1015	CDA 55
MCAN 56	1	L	X	X		SW-3	3/24/90 1025	CDA 56
MCAN 57	2	L	X			MW-1	3/24/90 1205	CDA 57
MCAN 58	2	L	X			MW-2	3/24/90 1215	CDA 58
MCAN 59	2	L	X			MW-3	3/24/90 1245	CDA 59
MCAN 60	5	L	X	X		A 16	3/24/90 1300	CDA 60
MCAN 61	5	L	X	X		A 17	3/24/90 1330	CDA 61
MCAN 62	5	L	X	X		A 18	3/24/90 1345	CDA 62
MCAN 63	4	L	X	X	Equip Rinsate	ER-1	3/24/90 1400	CDA 63

EPA Form 9110-1 (8-88) Replaces EPA Form 2075-8, which may be used. Green - SMO Copy Pink - Region Copy White - Lab Copy for Return to SMO Yellow - Lab Copy

FIGURE 8-3
INORGANIC TRAFFIC REPORT
HAVERTOWN PCP SITE

TCN 4212-01-FSP
REVISION NO. 0
10/AUG/90

(3) The name and address of the laboratory where the samples are being shipped.

(4) The date the samples were shipped, the commercial carrier and the airbill number for the container in which the samples were shipped.

(5) Sample description (water, soil/sediment, etc.).

In the bottom portion, from left to right, list the following:

CLP sample number

(A) The sample description (codes are obtained from box 5 in upper right corner of the form). Blanks of aqueous matrix should be listed with a code number of 3.

(B) The sample concentration (L, M, or H)

(C) X out the analyses requested

(D) Under "special handling", list the quality control samples, matrices notes, etc.

(E) The station location

(F) The date/time of sample collection

(G) Corresponding CLP organic or inorganic sample number

8.4 SPECIAL ANALYTICAL SERVICES PACKING LIST

For laboratory services contracted by CLP as special analytical services, TCL/TAL fast turnaround, grain size, a SAS Packing List will be completed as shown on Figure 8-4 (for Dioxin Shipping see Section 8.5).

FIGURE 8-4

SPECIAL ANALYTICAL SERVICE PACKING LIST
HAVERTOWN PCP SITE

U.S. ENVIRONMENTAL PROTECTION AGENCY
CLP Sample Management Office
P.O. Box 818 - Alexandria, Virginia 22313
Phone: 703/557-2490 - FTS/557-2490

SAS Number
5502C
TASK 2

SPECIAL ANALYTICAL SERVICE
PACKING LIST

Sampling Office: TETRA TECH	Sampling Date(s): 6/18-0/19/90	Ship To: 713-266-6800 KEYSTONE ENVIRON. RESOURCES (KEYTX) 3911 FONDREN SUITE 100 HOUSTON, TX 77063-5821 Attn: KATHY DOTY	For Lab Use Only
Sampling Contact: DALE SWENSON (name)	Date Shipped: 7/17/90		Date Samples Rec'd:
302-738-7551 (phone)	Site Name/Code: MSGS		Received By:

	Sample Numbers	Sample Description i.e., Analysis, Matrix, Concentration	Sample Condition on Receipt at Lab
1.	5502C-Z-1 (BD-02)	TCLP-TAL / DRUM SOLIDS / HIGH CONC.*	
2.	5502C-Z-2 (BD-03)	↓	
3.	5502C-Z-3 (BD-05)	DRUM SOLID - POLYMER	
4.	5502C-Z-4 (BD-04)	FLAMMABLE LIQUID	
5.			
6.			
7.		* Note - Extraction will probably not be high concentration	
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
16.			
17.			
18.			
19.			
20.			

AR300084
For Lab Use Only

White - SMO Copy, Yellow - Region Copy, Pink - Lab Copy for return to SMO, Gold - Lab Copy

The following information must be provided to complete the Packing List:

The top portion of the list will include:

- In the upper right hand corner, the SAS Number that has been assigned by CRL;
- Identify the Sampling Office: "TETRA TECH", the sampling contact: Dale Swenson and the telephone number: (302) 738-7551;
- The date(s) of sampling and the date shipped;
- Site Code - HAVERTOWN; and
- The name and address of the laboratory, the contact person and telephone number.

The bottom portion must include:

- A sample number of each sample bottle: the number will be the SAS Number plus a consecutive dash number for each sample contains (e.g., 5226-01, 5226-02); and
- The sample description which will be include type of analysis, sample matrix and whether High, Medium or Low Concentration.

8.5 CLP DIOXIN SHIPMENT RECORD

Shipping records for samples to be sent to the laboratory per the CLP SAS requests for dioxin and dibenzofuran analysis will be completed as shown on Figure 8-5. The following information must be provided to complete the shipment record:

FIGURE 8-5

CLP DIOXIN SHIPPING RECORD
HAVERTOWN PCP SITE

USEPA Contract Laboratory Program
Sample Management Office
P.O. Box 818 Alexandria, Virginia 22313
FTS 8-557-2490 703/557-2490

CASE NO:	BATCH NO:

CLP DIOXIN SHIPMENT RECORD

Site Name:	Sampling Office:	Ship To:
City & State:	City & State:	
EPA Site No:	Sampling Contact:	Date Shipped:
Latitude:	(name)	
Longitude:	Sampling Date:	
Tier: 1 2 3 4 5 6 7 (circle one)	Data Turnaround: 15-Day ____ 30-Day ____	

SAMPLE NUMBERS	MATRIX: SOIL/SEDIMENT	MATRIX: OTHER: ____	DESCRIPTION: FIELD SAMPLE	DESCRIPTION: SAMPLE TO DUPLICATE	DESCRIPTION: SAMPLE TO SPIKE	DESCRIPTION: BLANK	DESCRIPTION: EQUIPMENT RINSATE	DESCRIPTION: OTHER: (BAS ONLY) ____	ADD'L ANALYSIS: SPECIFY: (BAS ONLY) ____

WHITE—SMO Copy YELLOW—Region Copy PINK—Lab Copy for Return to SMO GOLD—Lab Copy

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The top portion of the record will include:

- In the upper right hand corner, the Case Number that has been assigned by the CRL;
- The dioxin sample Batch Number (each batch is 24 containers);
- The site name and address: HAVERTOWN;
- The EPA site number: OTFA03N954;
- Identify the Sampling Office Name and Address: TETRA TECH, Newark, DE, and the sampling contact: Dale Swenson;
- The date of sampling and the date shipped;
- The name code and address of the laboratory where the samples were shipped; and
- Check the Date Turnaround for 30 days.

The bottom portion must include:

- The sample number: the container label identification number (e.g., DC-0449-01); and
- Mark with an X the appropriate sample matrix (sediment/water) and sample description (field sample, duplicate, etc.).

8.6 Dioxin Performance Evaluation Tracking Form

For each batch of dioxin samples per matrix, one or two Performance Evaluation Material (PE) samples, as determined by the CRL, will be sent to the laboratory for analysis. The sample(s) will be sent to Tetra Tech by the Regional Sampling Control Center (RSCC). Each PE

sample will receive a dioxin DC label. The laboratory will receive the PE sample to be analyzed as one sample per batch. Using the Dioxin PE Tracking Form, the CRL will document sample chain-of-custody. After completion of the sampler information section of the form, it will be mailed to Pat J. Krantz at the CRL (not the laboratory). An example of the completed form is included as Figure 8-6.

8.7 EPA SAMPLE SHIPPING LOG

This log is to be sent to the EPA Central Regional Laboratory after the samples have been shipped to the laboratory. The log is divided into three sections. The first section, which includes items (1) through (6), must be completed for all sample shipping logs. For organic and inorganic analysis, Items (7) through (9) of the shipping log are to be completed. All other analysis, dioxin and grain size which require SAS Requests, Items (10) through (13) must be completed. An example of a completed shipping log for organics/inorganics is shown in Figure 8-7. Figure 8-5 shows an example of a completed shipping log for a SAS Request for dioxin. To complete the form, the following information must be provided:

Section 1 - All Shipping Logs:

(1) Complete the page number;

The case number,
The SAS number, if applicable,
The site name,
The name and phone number of the site leader,
The name of the EPA project officer.

FIGURE 8-6

DIOXIN PE TRACKING FORM
HAVERTOWN PCP SITE

DIOXIN PE TRACKING FORM

PURPOSE:

Per program QA/QC specification, each batch or shipment of samples submitted by the region for Analysis by CLP often includes one or more "blind" PE sample(s). The PE samples are prepared by EMSL/LV or ITT and are provided to the region for inclusion in sample shipments. It is essential that these PE samples are identified and that information concerning the chemical composition of individual PE samples be routinely available to the CLP's National Program Office QA staff and EMSL/LV for use in laboratory and program evaluation activities. The following information will be required.

****

To be Completed by Sampler and Mailed to Address Below:

Site Name: _____ Date: _____

Laboratory: _____ SAS No. _____

CLP/SMO number assigned to PE Sample: _____
(From Packing List or Shipment Record)

EPA No. _____

****

To be Completed by CRL:

Bottle Code: _____ Date: _____

Shipped to: _____

_____

_____

Spike Concentration: _____

_____

****

To be Completed by Data Reviewer

Laboratory Concentration Reported: _____

_____

****

Return Form to: P.J. Krantz
U.S. EPA Region III
Central Regional Laboratory
839 Bestgate Road
Annapolis, MD 21401

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(1) page 1 of 1 EPA SAMPLE SHIPPING LOG FOR ALL SAMPLES SENT THROUGH THE CONTRACT LAB PROGRAM (12/85 version)

CASE# 1736 SAS# _____ SITE NAME: McAroo

Site Leader: Christopher Burns EPA Project Officer: Evelyn Downs

Phone:

QC SAMPLE INFO AND/OR COMMENTS	CONC. (low/ med/ high)	SAMPLE PHASE (aq/ sol)	TYPE OF REQUEST org,dio inor, SAS	SAMPLE TRAFFIC REPORT NUMBER	ORGANICS OR INORGANICS DATA RECEIVED								SAS REQUEST: (details required) (10)			
					LAB NAME	DATE SHIPPED	XX out items not requested VOA	BNA	PEST	TCDD	METALS	CN	LAB NAME	SAS REQUEST (itemize)	DATE SHIPPED	DATA REC'D
(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(9)	(9)	(9)	(9)	(9)	(11)	(12)	(13)	
	L	Sol	ORG	CAN 51	SWOK	3/23/89			X	X	X	X				
	L	Sol	ORG	CAN 52					X	X	X	X				
	L	aq	ORG	CAN 53				X	X	X	X	X				
	L	Sol	ORG	CAN 54					X	X	X	X				
Dup of CAN 54	L	Sol	ORG	CAN 55					X	X	X	X				
	L	Sol	ORG	CAN 56					X	X	X	X				
Lab QC	L	Sol	ORG	CAN 57					X	X	X	X				
	L	Sol	ORG	CAN 58					X	X	X	X				
	L	Sol	ORG	CAN 59					X	X	X	X				
	L	Sol	ORG	CAN 60					X	X	X	X				
	L	Sol	ORG	CAN 61					X	X	X	X				
	L	Sol	ORG	CAN 62					X	X	X	X				
	L	Sol	ORG	CAN 63					X	X	X	X				
Field Blank	L	aq	ORG	CAN 64					X	X	X	X				
Equip Rinse Blank	L	aq	ORG	CAN 65					X	X	X	X				
Trip Blank	L	aq	ORG	CAN 66				X	X	X	X	X				
Dup of CAN 53	L	aq	ORG	CAN 67	✓	✓		X	✓	✓	✓	✓				

EPA SHIPPING LOG
HAVERTOWN PCP SITE

FIGURE 8-7

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(2) Under "QC Sample Info and/or Comments", list field duplicates, laboratory quality control samples, field blanks, equipment rinseate blanks, and trip blanks;

(3) Under "Conc.", list sample concentration (L, M or H);

(4) List sample phase: "aq" for aqueous, "sol" for soil and sediment;

(5) The type of analysis requested: "org" for volatile organic compounds, BNA compounds, and Pesticides/PCB's; "dio" for dioxins; "inor" for inorganics and "SAS" for special analytical service;

(6) Under "Sample Traffic Report Number", list the CLP sample number;

Section 2 - Organics or Inorganics:

(7) Under "Lab Name", list the abbreviation for the CLP laboratory;

(8) List the date the samples were shipped;

(9) Leave blank the analyses requested, X out analyses not requested;

Section 3 - SAS Requests:

(10) Description of type analysis required;

(11) Under "Lab Name", list the abbreviation for the CLP laboratory;

(12) Itemize the analysis requested: dioxin, grain size, etc.; and

(13) List the date the samples were shipped.

8.8 PACKAGING AND SHIPPING

Once the samples have been collected, properly labeled and tagged, these steps should be followed to properly pack and ship the samples:

- Seal all containers in clear plastic bags (The chain-of-custody seals, depicted in Figure 8-9, are not to be placed on individual sample containers because the adhesive on the back of the seal may potentially affect sample integrity);
- Pack all medium and high level and dioxin samples in metal paint cans:
  - Label paint cans with sample number of sample contained inside;
  - Surround contents of can with vermiculite;
- Pack all samples in sturdy ice chest for shipment;
- Pack all soil and sediment VOA's in inverted position;
- Use freezer packs to cool the organic low level water samples and the low level organic and inorganic soil/sediment samples to 4°C;
  - Do not cool dioxin, inorganic low level water, inorganic medium/high level water or soil/sediment, or organic high level water or soil/sediment samples;
- Surround ice chest content with vermiculite;
- Tape paperwork in plastic bag on inside of cooler lid (The paper work includes the chain-of-custody record, and the bottom two copies of the traffic report); and
- Close cooler and seal with custody seals.

FIGURE 8-8

CLP SAMPLE NUMBERS
HAVERTOWN PCP SITE

				Bottle	Can
				DC 0449 01 DIOXIN	DC 044901 DIOXIN
				DC 0449 02 DIOXIN	DC 0449 02 DIOXIN
CBM 15	- Extractable	MCFH 01	- Total Metals	DC 0449 03 DIOXIN	DC 044903 DIOXIN
CBM 15	- Extractable	MCFH 01	- Total Metals	DC 0449 04 DIOXIN	DC 044904 DIOXIN
				DC 0449 05 DIOXIN	DC 044905 DIOXIN
CBM 15	- Extractable	MCFH 01	- Cyanide	DC 0449 06 DIOXIN	DC 0449 06 DIOXIN
CBM 15	- Extractable	MCFH 01	- Cyanide	DC 0449 07 DIOXIN	DC 044907 DIOXIN
				DC 0449 08 DIOXIN	DC 0449 08 DIOXIN
CBM 15	- VOA	MCFH 01		DC 0449 09 DIOXIN	DC 044909 DIOXIN
CBM 15	- VOA	MCFH 01		DC 0449 10 DIOXIN	DC 0449 10 DIOXIN
				DC 0449 11 DIOXIN	DC 044911 DIOXIN
CBM 15		MCFH 01		DC 0449 12 DIOXIN	DC 0449 12 DIOXIN
CBM 15				DC 0449 13 DIOXIN	DC 0449 13 DIOXIN
				DC 0449 14 DIOXIN	DC 0449 14 DIOXIN
CBM 15				DC 0449 15 DIOXIN	DC 0449 15 DIOXIN
CBM 15				DC 0449 16 DIOXIN	DC 0449 16 DIOXIN
				DC 0449 17 DIOXIN	DC 0449 17 DIOXIN
				DC 0449 18 DIOXIN	DC 0449 18 DIOXIN
				DC 0449 19 DIOXIN	DC 0449 19 DIOXIN
				DC 0449 20 DIOXIN	DC 0449 20 DIOXIN
				DC 0449 21 DIOXIN	DC 0449 21 DIOXIN
				DC 0449 22 DIOXIN	DC 0449 22 DIOXIN
				DC 0449 23 DIOXIN	DC 0449 23 DIOXIN
				DC 0449 24 DIOXIN	DC 0449 24 DIOXIN

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FIGURE 8-9

CHAIN-OF-CUSTODY SEAL AND SAMPLE TAG
HAVERTOWN PCP SITE

CUSTODY SEAL
Date
Signature

UNITED STATES · ENVIRONMENTAL PROTECTION AGENCY ·

UNITED STATES · ENVIRONMENTAL PROTECTION AGENCY ·

CUSTODY SEAL
Date
Signature

★ GPO 605-924

Designate: Grab / Comp.
Time
Month/Day/Year
Station No.
Project Code
Station Location
Samplers (Signatures)

Preservative:
Yes ☐ No ☐

ANALYSES

BOD Anions Solids (TSS) (TDS) (SS)	
COD, TOC, Nutrients	
Phenolics	
Mercury	
Metals	
Cyanide	
Oil and Grease	
Organics GC/MS	
Priority Pollutants	
Volatile Organics	
Pesticides	
Mutagenicity	
Bacteriology	

Remarks:

Tag No. 3-1167959 Lab Sample No.

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APPENDIX A

TETRA TECH INC.

STANDARD OPERATING PROCEDURES

A. FIELD MEASUREMENT OF WATER TEMPERATURE

B. FIELD MEASUREMENT OF pH

C. FIELD MEASUREMENT OF SPECIFIC CONDUCTANCE

D. FIELD MEASUREMENT OF ORGANIC VAPORS

E. OPERATING PROCEDURES - MSA MODEL 260 COMBUSTIBLE GAS/OXYGEN METER

F. OPERATING PROCEDURES - MINI-RAM MODEL PDM-3

G. MEASUREMENT OF GROUND WATER SURFACE ELEVATION AND WELL CASING VOLUME

H. MEASUREMENT OF IMMISCIBLE PRODUCT THICKNESS

TETRA TECH STANDARD OPERATING PROCEDURE

FIELD MEASUREMENT OF WATER TEMPERATURE
Tt SOP-001

1. Carry two NBS - calibrated thermometers, in cases, into the field.

2. Check thermometer for cracks or gaps in the mercury.

3. Draw sample of at least 200 mL into beaker or sample bottle.

4. Place thermometer in sample. Do not allow thermometer bulb to touch sides of beaker. Allow to equilibrate (about 1 min).

5. Record temperature to nearest 1^{o} C in field logbook or on field data sheet.

6. On a quarterly basis, check against NBS-calibrated field laboratory thermometer. Agreement should be within 0.5^{o} C.

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TETRA TECH STANDARD OPERATING PROCEDURE

FIELD MEASUREMENT OF pH FOR SURFACE AND GROUNDWATERS
Tt SOP-002

Field Procedure

1. Rinse 500-mL plastic beaker with small portions of sample water 3 times.

2. Rinse electrodes with sample water.

3. Immerse electrodes in sample while swirling the sample, if needed, to provide thorough mixing. Turn on meter. Read pH to nearest 0.1 unit once the reading is stabilized.

4. Record sample pH. Note any problems such as drift of meter.

Instrument Calibration

1. Calibrate pH meter according to manufacturer's instructions in the field laboratory at the beginning of any day of field work or field lab work when pH will be measured, then recalibrate each time pH meter is moved (e.g., station to station), or at a minimum of every 10 samples analyzed.

Maintenance

1. Check batteries each time meter is used. Carry a spare battery pack and a screwdriver into the field in the pH meter case.

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TETRA TECH STANDARD OPERATING PROCEDURE

FIELD MEASUREMENT OF SPECIFIC CONDUCTANCE
Tt SOP-003

Field Procedure

1. Zero and span the instrument according to the manufacturer's instructions.

2. Collect water sample in 500-mL plastic beaker.

3. Swirl conductivity probe in sample; discard sample.

4. Collect fresh sample in beaker.

5. Measure sample temperature to nearest 1^{0} C with the instrument, if possible, or an NBS-calibrated thermometer. Record temperature.

6. Immerse conductivity probe in sample. Move probe around in sample to displace any air bubbles.

7. Select the lowest appropriate multiplier setting to obtain the greatest meter needle deflection. Read the conductivity from the dial and record in field notebook.

Instrument Calibration

At the beginning and end of each day of sampling, determine cell constant in the field laboratory.

1. Rinse probe with one portion of the standard KCl solution.

2. Measure conductivity of another portion of the standard KCl solution.

3. Measure temperature of standard KCl solution.

4. Calculate cell constant. The cell constant is the ratio of the known conductivity to the measured conductivity of the standard KCl solution. Use this constant and measured field temperatures and conductivities to calculate conductivity at 25° C for each sample taken during the day.

Maintenance

1. Store meter in the field laboratory with the probe immersed in deionized water.

2. Check batteries each morning before taking meter into the field. Carry spare alkaline batteries and screwdriver.

3. Inspect conductivity electrodes on a monthly basis for loss of platinum black.

4. When platinum black has flaked off, a sharp end point cannot be achieved, or readings are erratic, clean and replatinize probe according to the manufacturer's instructions.

Calculations

1. Correct all conductivities (including measured conductivity of KCl standard) to 25° C:

$$K = \frac{K_{measured}}{1 + 0.0191(t-25)}$$

where:

t = temperature of measurement, ^{o} C

K = conductivity, umhos/cm

2. Using temperature-corrected conductivities, adjust sample conductivity (at 25^{o}) by cell constant:

$$\text{Conductivity} = \frac{K_{SD}}{K_{KCl}} \times K_{sample}, \text{ umhos/cm}$$

where:

K_{SD} = listed conductivity of standard KCL solution

K_{KCL} = measured conductivity of standard KCL solution

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TETRA TECH STANDARD OPERATING PROCEDURE

ORGANIC VAPOR ANALYZER (OVA)
Tt SOP-023

STARTUP

1. Move PUMP switch to ON and check battery condition by moving the INSTR switch to RATT position.

2. Move INSTR switch to ON and allow five (5) minutes for warmup.

3. Set Alarm Level Adjust knob on back of Readout Assembly to desired level.

4. Set CALIBRATE switch to X10 position, use CALIBRATE knob and set meter to read 0.

5. Move PUMP switch to ON position, then place instrument panel in vertical position and check SAMPLE FLOW RATE indication.

6. Open the H2 TANK VALVE and the H2 SUPPLY VALVE.

7. Depress igniter button until burner lights. Do not depress igniter button for more than six (6) seconds. (If burner does not ignite, let instrument run for several minutes and again attempt ignition.)

8. Use CALIBRATE knob to "zero" out ambient background. For maximum sensitivity below 10 ppm, set CALIBRATE switch X1 and readjust zero on meter. To avoid false flame-out alarm indication, set meter to 1 ppm with CALIBRATE knob and make differential readings from there.

9. Place probe in the atmosphere to be monitored. If the needle moves to the upper limit of the scale, change the calibrate switch to the next position.

SHUTDOWN

10. Close the H2 SUPPLY VALVE and the H2 TANK VALVE.

11. Move the INSTR switch and PUMP switch to OFF.

12. Instrument is now in shutdown configuration.

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TETRA TECH STANDARD OPERATION PROCEDURES

COMBUSTIBLE GAS/OXYGEN METER
MSA MODEL 260
Tt SOP-024

This instrument is intended to measure concentrations of combustible gases and oxygen in air, and warn the user when concentrations of either exceed predetermined levels.

Before use, test instrument operation as follows:

- To test battery:
  - Turn function knob to the "on" position. Green indicator light should be on, and flow indicator should be moving.
  - Press "check" button. LEL meter should register 80 to 100 in battery section of dial.
- To test alarm settings:
  - Turn function knob to "on" position.
  - Using calibrate knobs, set oxygen meter at 21 percent and LEL at 0. Push reset button. Both red warning lights and audible alarms should be off.
  - Adjust the oxygen calibration knob until needle registers less than 19.5 percent. The red oxygen indicator light should flash, and the audible alarm should sound.

Return the needle to 21 percent, and push alarm reset. Now move the needle to above 25 percent. Both the visual and audible alarms should be triggered. "Re-zero" the oxygen meter by resetting it to 21 percent, and push the reset button.

- The instrument should be on, the oxygen meter should be set to 21 percent, and the LEL meter should be set to 0. Adjust the LEL calibration knob until the needle registers more than 50 percent. The LEL alarms should go off at 50 percent. Return the needle to 0, and reset the alarm.

- The instrument may be calibrated for sensitivity to explosive gasses using a portable calibration gas kit. Refer to the MSA calibration kit instructions for specific information. (Briefly, assemble the calibration gas cylinder, regulator, and tubing. With the instrument in normal operating mode, and both the LEL and the oxygen meter "zeroed", attach the calibration gas to the instrument with the sample hose provided in the calibration kit. Open the gas cylinder and observe the LEL meter. The meter should register a value equal to the level marked on the calibration gas cylinder label. If the proper reading is not obtained, the instrument should not be used until the source of the discrepancy is discovered.)

■ For normal use, follow these steps:

- Switch the instrument on, and zero both the LEL and oxygen meters in a clean environment. If the instrument can not be zeroed, either the oxygen or the LEL sensors are defective, and the instrument should not be used.

- Select the sample tubing or probe options appropriate for the site. The sample hoses come in several lengths. The shorter lengths are appropriate for most sites, and the longer hoses are typically used for monitoring in remote locations, or in man holes. If you will be using the CG/02 meter near liquids, attach the liquid trap to the instrument between the sample hose and the CG/02 meter. This will keep any liquids from entering the instrument. If the site is dusty, attach the filter cartridge and dust filter to the sample hose. If there are lead containing products on the site (like leaded gasoline), attach the filter cartridge and an inhibitor filter to the sample line. The inhibitor filter contains a glass ampule which should be broken before placing the filter in the filter housing. The filter will decrease the chances for lead compounds to damage the combustible gas sensor. The filters are good for about 8 h.

■ Other general information:

- The instrument will only give accurate information in air. The instrument will not indicate the concentration of combustible gases in an inert gas background. The instrument is also affected by elevation, and areas of high or low pressure.

- The instrument runs approximately 8 h on a charge. The charge time is 16 h. The CG/02 meter utilizes nicad batteries, and as a result, should be discharged fully before recharging to prevent damage and reduced battery life.

TETRA TECH STANDARD OPERATING PROCEDURES

PERSONAL AEROSOL MONITOR
MINIRAM MODEL PDM-3
Tt SOP-025

Specifications and Warnings

Instrument will run for 10 h on a battery charge. Recharge requires 12 h. Discharge batteries completely prior to recharge to maximize battery life. Low battery condition is indicated by visual display.

Instrument range is 0.00 to 99.9 mg/m^3, and the programmed run time is 500 min (8 h and 20 min). Other run times can be programmed into the miniram.

Do not operate instrument without sunshield.

Do not touch the inside of the sensing chamber, or the sensing chamber windows.

Functions

Off: If display is blank, press "OFF" prior to pressing any other command keys. Once "OFF" is pressed, the instrument will display "OFF". The "OFF" key is also used to end the monitoring mode.

Meas: To begin monitoring mode, check that the instrument is in the "OFF" mode, then press "MEAS". Instrument will begin monitoring aerosol particulate levels, displaying a new value every 10 sec.

Zero: To zero out background dust or residual contamination build up in

sensing chamber, press "ZERO" while instrument is in "OFF" mode. Instrument will average 4-10 sec readings and store this value as the new background. To call up background value, press "ZERO" while in monitoring mode. Instrument will interrupt the monitoring display to briefly display the stored zero value.

PBK: To recall stored data from last seven monitoring events on visual display, press "PBK" for 1 sec or longer when instrument is in off mode. Instrument will display, in order, the following information:

- The instrument identification number will be displayed with the "ID" indicator bar on.
- Next the shift or run number will be displayed. The most recent run is number 7, the first run is number 1. The "OVR" indicator bar will be on as identification.
- The next value will be the time in minutes for the run indicated.
- Next will be the time in tens of minutes since the last monitoring run.
- The last value displayed is the average value in mg/m^3 for that run. If an average value of 9.99 is displayed, a significant overload condition was encountered during that run.
- The sequence is repeated 7 times, once for each stored monitoring run. Only the last seven runs will be stored.

Pressing the "PBK" key for less than 1 sec will cause the message "PA" to be displayed. This is done to play back the stored values on a strip chart recorder or other recording device. Consult the instrument manual for more information. If you unintentionally pressed "PBK" for less than 1 sec, and

now have the display "PA" on the screen, simply press "OFF", then "PBK" for longer than 1 sec to enter the visual playback mode.

ID: A changeable ID number is stored in the Miniram, to identify any printed readout. This ID number can be displayed by pressing "ID" when the instrument is in the "MEAS" mode. The ID number can be changed by pressing the "ID" key while the instrument is in the off mode. Once the number is displayed, change the value in increments by pressing either the "TWA" or "SA" keys (directional arrows on the keys indicate which direction the number will change).

TWA: To get the time weighted average (aerosol concentration averaged over the run up to that instant), press "TWA".

SA: To get the shift average (the aerosol concentration averaged over an 8-h shift period) press "SA".

Time: To get the length of the monitoring run, in minutes, since the run began, press "TIME" while in measure mode. Display will briefly display the run time up to that point, then return to the measure mode. To get a continuous run time (longer than 500 min) press "TIME", and then simultaneously press "MEAS".

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TETRA TECH STANDARD OPERATING PROCEDURE

MEASUREMENT OF GROUNDWATER SURFACE ELEVATION AND WELL CASING VOLUME
Tt SOP-101

Field Procedures

1. Switch on water level probe and check audible indicator tone with test button. Insure that tape and probe have been decontaminated prior to placing in well.

2. Holding reel atop casing, lower tape gradually into well until tone sounds, indicating contact with water surface. Use care not to scrape printed markers on the top of well casing (TOC).

3. Hold graduated tape to mark at TOC and read, to the nearest 0.01 ft, the depth to water surface.

4. Record depth indicated as depth to water surface below TOC.

5. Draw probe about halfway up well, then lower and repeat Steps 2 through 4. If readings differ by more than 0.01 ft, repeat until readings stabilize.

6. Remove probe from well.

7. If the bottom of the well must be located, lower a weighted steel measuring tape slowly from center of casing.

8. When weight is felt to hit bottom, or tape slacks noticeably, draw tape up very slowly until it is taut again.

9. Note tape reading at level of casing top. Record this as well depth below TOC, to the nearest 0.1 foot.

10. Repeat Steps 7 through 9 to confirm well depth.

Maintenance

1. Carry spare alkaline batteries for the water level probe at all times. Check the circuitry in the field laboratory weekly during a sample run, by assembling the apparatus and dipping the probe into a beaker of water.

2. Clean both tapes after measuring each well by rinsing with distilled water and wiping dry with paper towels.

Calculations

Absolute water table elevation (ft MSL)

= Elevation of TOC (surveyed) - Average depth to water (below TOC)

Volume of water contained in casing (gal):

= [Depth to bottom of well (ft) - depth to water (ft)] x [inside radius of casing (ft)]^2 (23.49)

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April 1989

TETRA TECH STANDARD OPERATING PROCEDURE

MEASUREMENT OF IMMISCIBLE PRODUCT THICKNESS IN WELLS BY INTERFACE PROBE
Tt SOP-102

1. Before activating the probe, attach the grounding clip to a suitable earth ground. Ensure that the probe and tape have been properly decontaminated prior to placing in well.

2. To turn the unit on, unfold the crank handle away from the reel housing. This activates a power switch inside the reel.

3. To verify the unit is operational press the test button on the face plate. If the power is on, the alarm will sound. A low battery light will indicate if battery replacement is necessary.

4. To release the probe, pull the protector tube outward from the reel casing. To lower the probe, tilt the front of the reel housing forward and press the brake release, located just forward of the handle. The tape will pay out as long as the brake release is depressed. Note that the tape should not be allowed to rub against the well casing as this could damage the tape.

5. When the probe contacts liquid, an alarm in the reel will sound. An oscillating tone indicates water, a solid tone indicates hydrocarbons. To determine the exact thickness of a floating hydrocarbon layer, the probe should be moved slowly up and down so the alarm goes from no tone to solid tone. The exact point where the tone goes solid should be read from the tape, using the mark on the well casing as a reference, and recorded in the field log book.

6. The probe should then be lowered until the alarm tone starts oscillating. The probe should be moved slowly up and down until the exact point from where the tone goes from solid to oscillating is found. Subtracting the first reading from the second reading gives the thickness of the floating hydrocarbon layer. Record this value in the field logbook.

7. To determine the thickness of sinking immiscible product in the well, the probe should be lowered further until the alarm goes from an oscillating tone to a solid tone. The probe should be moved slowly up and down so the alarm goes from oscillating tone to solid tone. The exact point where the tone goes solid should be read from the tape, and recorded in the field notebook. Measuring the depth to the bottom of the well according to Tt SOP-101, and subtracting the well depth value from the depth to the top of the sinking product determined here gives the thickness of the sinking immiscible product layer in the well. Record this value in the field notebook.

8. After the measurements have been taken, snap the probes protector tube shut, so that the wiper rests against the tape.

9. While reeling in the tape, use a paper towel, wetted with distilled water, to clean the portion of the tape that did not contact liquid in the well.

10. Remove from the well, but do not reel in, the portion of the tape and probe that did contact product and/or groundwater in the well. Place the tape and probe in a basin, wash with trisodium phosphate solution, and rinse with distilled water. Solvents (e.g., hexane, methanol) and a brush may be required to remove some immiscible products from the tape and probe.

Reference

Oil Recovery Systems. No Date. Interface probe manual. Oil Recovery Systems, Inc. Greenville, NH. 11 pp.